The human stem cells debate: A UK perspective

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Abstract The potential use of embryonic stem cells for the treatment of common diseases raises a number of ethical concerns relating to the use of embryos in research and the possibility of human reproductive cloning. This paper assesses the debate about the moral permissibility of research using embryonic cells and outlines recent changes in UK legislation.

Keywords: stem cell therapy, embryo research, Human Fertilisation and Embryology Act, ethics, cloning

Introduction

There has recently been a great deal of interest in research on human stem cells, which have the capacity to both replicate themselves, and develop into more specialised cells in the body. Researchers are beginning to maintain stem cell lines *in vivo* and induce them to differentiate into specialised cells, such as muscle and nerve cells (a team led by Alan Trounson and Michael Pera at Monash University in Melbourne has grown primitive muscle and nerve cells from human embryonic stem cells).[1] This research raises the possibility of developing innovative therapies for patients suffering from injuries or degenerative diseases by replacing damaged cells and tissues with appropriate stem cells or specialised cells. Conditions that may benefit from stem cell therapy include hepatitis, leukaemias, diabetes, multiple sclerosis and rheumatoid arthritis.

Despite the wide range of potential uses of stem cell therapy there has been extensive public debate about whether the research needed to develop stem cell lines should be permitted. Such research is controversial because much of it is currently focused on deriving stem cells from human embryos and cadaveric foetal tissue, although research into the possibility of deriving stem cells from adult cells is also being conducted. This paper will focus on the primary topic of public debate: concerns about conducting research on *embryos* to derive stem cells. Such debates have been and are still taking place around the world. This paper primarily focuses on the debate in the UK.

Background

Initial efforts to establish embryonic stem cells lines will require research on embryos. In the UK, research on human embryos is governed by the Human Fertilisation and Embryology Act (1990). The HFE Act permits the Human Fertilisation and Embryology Authority (HFEA) to license certain forms of research on embryos of up to 14 days of development. The HFEA cannot license any research unless it appears to the Authority to be necessary or desirable for one of the following purposes:

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- promoting advances in the treatment of infertility;
- increasing knowledge about the causes of congenital disease;
- increasing knowledge about the causes of miscarriage;
- developing more effective techniques of contraception; or
- developing methods for detecting the presence of gene or chromosome abnormalities in embryos before implantation,or such other purposes as may be specified in regulations by the Secretary of State.

The therapeutic use of stem cells was not envisaged when the Act was drafted and no specific provision was made for research for such purposes to be licensed.[2]

In 1998 the HFEA and the Human Genetics Advisory Commission (HGAC) considered the therapeutic use of stem cells and published a report recommending that two further purposes be added to the list of purposes outlined above:

- developing methods of therapy for mitochondrial diseases;
- developing methods of therapy for diseased or damaged tissues or organs.[3]

In response to this report, in June 1999 the Government set up an Expert Advisory Group, chaired by the Chief Medical Officer (CMO), Professor Liam Donaldson, to advise whether embryonic research for the purpose of developing stem cell therapies should be permitted. In June 2000 the Expert Advisory Group reported, recommending that 'research using embryos (whether created by *in vitro* fertilisation or cell nuclear replacement) to increase understanding about human disease and disorders and their cell-based treatments should be permitted', subject to the controls in the HFE Act. The Government accepted the Report's recommendations in full and proposed that in addition to the five research purposes permitted under the Act, research on embryos should also be permitted for the following further purposes:

- increasing knowledge about the development of embryos;
- increasing knowledge about serious diseases;
- enabling any such knowledge to be applied in developing treatments for serious diseases.

The issue of what would count as a 'serious disease' was raised, since the language of the amendments is vague and no particular diseases are specified. However, it was generally agreed that the phrase was commonly understood and would be interpreted fairly. No doubt as research progresses, this question will arise again. The proposed amendments were subject to a debate and a vote in both the House of Commons and the House of Lords. The Government announced that this would be a free vote, and welcomed 'the opportunity for a full discussion of the important issues raised by the CMO's Expert Group Report'.

The public debate

Much of the extensive subsequent public debate about the acceptability of deriving stem cells from human embryos involved concerns about using embryos for any research purposes, a debate that began in the 1980s, prior to the passing of the HFE Act. This debate, which centres on defining the moral status of the early human embryo, has divided moral philosophers and theologians for centuries, and continues to do so, despite practical developments in the law and public policy governing embryos and foetuses.

At one end of the spectrum are those who hold that right from the moment of conception a human embryo is afforded the same moral status as a human being at any other stage of development, whether a foetus, child or adult. This means that any act that destroys or prevents the implantation and subsequent development of an embryo is prohibited. This includes not only all embryo research but also some assisted reproductive techniques, the morning-after pill and the termination of pregnancy. Furthermore, the potential

benefits to other people that might arise from the destruction of an embryo can never be used to justify that destruction. From this perspective, to argue that destroying embryos to save the lives of existing people would be analogous to arguing that healthy adults ought to be killed so that their organs can be used to keep others alive, and just as morally abhorrent.

The arguments in support of this view come mainly from religious doctrine, in particular Catholicism. In 2000, the Pontifical Academy for Life published a declaration regarding stem cell research which stated that

> the living human embryo is – from the moment of the union of the gametes – a *human subject*. . . such that at no later stage can it be considered as a simple mass of cells. . . . [I]t follows that as a *human individual* it has the *right* to its own life; and therefore every intervention which is not in favour of the embryo is an act which violates that right. *No end believed to be good. . . can justify an intervention of this kind*. (emphasis in original)[4]

At the other end of the spectrum are those who maintain that human embryos are equivalent, in moral terms, to any other collection of human cells, for example a liver or kidney. On this view, if embryos can be used to treat or cure people, they should be. More radically, this approach might suggest that other uses of human embryos, such as selling them for profit, or using them in cosmetics, could be sanctioned. This extreme position rarely finds supporters.

In between these positions is a view that we can term liberalism, which provides a more sensitive understanding of the moral status of an embryo. The liberal position holds that the moral status of a human being depends on its capacities. Various candidates for the capacities required to achieve full moral status have been put forward, for example the capacity for self-awareness, involvement with other people or emotional experience. The relative importance of these capacities is widely argued, but the key point is that by tying moral status to particular features of human beings (and perhaps other animals), it follows that as human beings change, their moral status also changes. The concept of a spectrum of views on enduring ethical dilemmas such the permissibility of abortion or euthanasia can be more constructive than the polarisation of opinions into discrete categories. For an excellent example of this approach, see Dworkin.[5]

It is unquestionably the case that all existing people were once embryos. The liberal accepts this, but does not infer from it that their current moral status is the same as it was when they were an embryo. However, the liberal does acknowledge that the necessary link between embryos and later people means that the human embryo has special value and therefore can be distinguished in moral terms both from non-human embryos, and from other collections of human cells. This special value entails that embryos ought to be respected and must not be used frivolously. However, when the destruction of embryos through research may lead to substantial benefits to existing and future generations, and when there is no clear evidence that those benefits can be achieved by any other route, the liberal can consider supporting such research. It is an uncontroversial fact that both normal sexual reproduction and *in vitro* fertilisation entail the loss of some embryos. In normal sexual reproduction, for every embryo that successfully implants and develops, there are some that either fail to implant or are lost at an early stage. With *in vitro* fertlisation, it is common practice in the UK for as many as six embryos to be created in one cycle. Some are returned to the woman but fail to implant and develop, others may be frozen and ultimately disposed of if not required. A further point in favour of the liberal position is that it can accommodate the commonly held belief that the goal of these processes, that is the creation of new life, is valuable enough to warrant this loss in either method of reproduction, on the grounds that the value of an embryo is not absolute and can be weighed against other considerations.

This approach was followed, either implicitly or explicitly, by many parties in the stem cells debate, including patient

support groups, the Chief Medical Officer's Expert Group, the Royal Society, the European Group on Ethics in Science and New Technologies (EGE), the Wellcome Trust and the Nuffield Council on Bioethics.[6] All agreed with the fundamental principle enshrined in the HFE Act; that embryos could be used in research provided this was done in a careful, respectful and well-regulated manner with the goal of significantly improving life for other people.

Perhaps surprisingly, senior members of the Church of England came to the same conclusion about the use of embryos in medical research, on the grounds that The Bible only accorded full moral status to foetuses that had 'quickened', not to embryos or early foetuses.[7] Canon Dr John Polkinghorne, chairman of the Church's Board for Social Responsibility Science and Medical Technology Committee, suggested that this view was in line with the majority of public thought and practice:

> 'It is fair to say that [the belief that embryos have full moral status] does not wholly correspond to actual practice. No-one seems to suggest holding a funeral service for an embryo that failed to implant and was lost.'[8]

The HFE Act is based on a liberal attitude to the use of embryos in research, allowing the use of 'spare' IVF embryos and the creation of new embryos where necessary. Given this context, it is difficult to see a moral difference between the types of research already permitted by the Act, namely research into reproductive issues, and the new types of research proposed by the amendments, namely research into serious diseases. After all, 'research into potential therapies is not qualitatively different from research into diagnostic methods or reproduction'.[9]

Prior to the parliamentary votes on the proposed additional research purposes, the majority of the media coverage of the debate reflected the first and third of the views outlines in this section (the view that no research on embryos should be permitted, and the liberal position). In December 2000, the House of Commons voted in favour of the additional research purposes, reflecting the liberal view, and in January 2001 the House of Lords voted similarly. The regulation under Schedule 2 of the HFE Act has been amended accordingly.

Confusion about cloning

Many of those who supported embryo research, including the amendments to the HFE Act, still considered there to be ethical questions that require further consideration. Many of these questions concern the use of cell nuclear transfer (CNT) (also referred to as 'therapeutic cloning'). As with organ transplants, stem cells or cells derived from them, may be rejected if implanted into the body. One possible way to avoid transplant rejection might be to use stem cells that are derived from the patient's own cells. This would involve placing the nucleus from a somatic cell of a patient into an unfertilised egg that has had its nucleus removed. The resulting egg would then be cultured *in vitro* to the blastocyst stage and used to initiate a cell line. (About five days after fertilisation the egg develops into a blastocyst, a hollow ball of cells. The outer layer for the blastocyst develops to form the placenta, the inner becomes the embryo.) This process of CNT would create a blastocyst that was almost completely genetically identical to the patient. As noted by the Royal Society, this approach still requires a good deal of further research before it could be considered a serious option.[10] Much of the concern about CNT concerns another use to which such technology could be put: in creating Dolly the sheep, scientists used CNT to create an embryo that was later implanted into the uterus of a sheep for gestation (also referred to as reproductive cloning).

Although the HFE Act expressly prohibits one type of cloning, the prohibition does not cover CNT.[14] (The HFE Act prohibits 'replacing the nucleus of a cell of an embryo with a nucleus taken from a cell of any person', whereas CNT involves replacing the nucleus of an unfertilised egg, rather than an embryo.) As a result, the HFEA could license CNT for the purposes under Schedule 2 of the HFE Act if it was thought

to be 'necessary and desirable'. When the additional research purposes proposed in the amendments to the Act were added, such as permitting stem cell research for the purposes of developing treatment for serious diseases, the possibility arose that CNT could also be licensed for this purpose. Although HFEA members have agreed that this kind of research, as long as it had a *non-reproductive* aim, would be considered, they have stated that 'research applications involving the nuclear replacement of eggs are likely to be some way off for a variety of reasons.'[11]

However, the fact that requests to use CNT for research into developing stem cell therapies were not likely to arise in the immediate future, was not, unsurprisingly, enough to calm some public fears. Two main concerns have been expressed. Firstly, therapies resulting from CNT would necessarily involve the deliberate creation of embryos rather than the use of 'spare' IVF ones. Secondly, the embryos would be created using the same basic technique that would be used in reproductive cloning. Some people felt that CNT was inherently wrong, regardless of whether the cloned embryo was implanted in a womb, while others were reluctant to support the amendment because they feared that though therapeutic cloning itself could be justified, it would set society inevitably on a slippery slope to reproductive cloning.

The European Group on Ethics recommended that embryos be used for research purposes, but declined to sanction CNT.[12] The group invoked the precautionary principle and argued that potential therapies from CNT were highly speculative. They noted that there might be other techniques available that would not require the creation of cloned embryos and that these would be preferable. They also declined to allow the creation of new embryos specifically for research purposes, permitting only the use of 'spare' IVF ones.

In the UK, however, the deliberate creation of embryos for research is already permitted under the HFE Act, provided the research cannot be carried out on donated embryos. In addition, the intention and expectation of many scientists is that this will be a temporary stage of research. As progress in research is expected to lead to the establishment of stem cell banks, the need for embryonic and foetal tissue should diminish as self-replicating stem cell lines become established. One goal of the research is to learn how an egg reprograms the nucleus from an adult cell, so that adult cells can be reprogrammed without having to create a cloned embryo. This accords with the requirement set out by both the liberal acceptance of embryo research and the HFE Act, that such research would only be permitted if its goals could not be achieved by a different route.

The other reason offered for refusing to allow therapeutic cloning was the fear that it would lead to reproductive cloning. During the parliamentary debates, it was clearly stated that reproductive cloning was already prohibited by UK law, because it would require a licence from the HFEA, and such licences would not be granted, but that additional legislation would be considered if necessary.[13] In the months since the Houses of Parliament voted to allow research into CNT, there has been considerable media attention given to a small number of scientists claiming to be actively attempting to clone human beings, although not in this country.[14] Perhaps as a result, the Government has recently confirmed that it will 'legislate in the near future to explicitly ban human reproductive cloning in the UK'.[15]

Adult stem cells

While the debate on stem cells was underway, research on reprogramming adult stem cells was published.[16] Opponents of embryonic stem cell research argued that this obviated the need to extend the HFE Act. However, most scientists argued that the proliferative capacities of adult stem cells, and their ability to form different cell types, were seriously limited in comparison to embryonic stem cells. According to one commentator, although it is possible that one day all the benefits of embryonic stem cell research could be

achieved using adult stem cells, 'there is simply not enough data at present to support this assertion'.[17] The House of Lords has subsequently established a Select Committee on stem cell research to consider various issues including the use of adult stem cells as an alternative path for research. The Committee is scheduled to report by the end of 2001.

Conclusion

The use of human embryos in research has been vigorously debated for many years. Although the views at the extremes of the debate appear irreconcilable, this has not precluded substantial developments in law and policy in the UK: since the HFE Act of 1990, it has been possible to use human embryos of up to 14 days of development for selected types of medical research. The most recent development in this area is the extension of the purposes for which embryos can be experimented on, to include research into developing stem cell therapy for the treatment of serious diseases. The recent amendment to regulation under the HFE Act generated concern, even for those in favour of embryo research, because of fears about reproductive cloning and reservations about a decline in the moral status and value accorded to embryos. Despite these concerns, both Houses of Parliament voted to allow the new research, ultimately persuaded, as were most parties to the debate, by the desire to help those afflicted by serious and debilitating disease.

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