

Available Online at

http://www.ijcpa.in

International Journal of CHEMICAL AND PHARMACEUTICAL ANALYSIS

January-March 2019

eISSN: 2348-0726 ; pISSN : 2395-2466

Review Article

DOI: http://dx.doi.org/10.21276/ijcpa

Volume-6Issue-2Article ID: 0011

CONTROVERSIES OVER RESEARCH EMBRYONIC STEM CELL

Subhadra Rajpoot, Devangna Paul, Jasmeet Kaur

Amity University, 48a, Knowledge Park III, Greater Noida, Uttar Pradesh 201308, India

*Corresponding Author: Email: <u>Srajpoot@gn.amity.edu</u>

Received: 13 April 2018 / Revised: 22 September 2018 / Accepted: 6 March 2019 / Available online: 31 March 2019

ABSTRACT

The discovery of stem cells notably embryonic stem cells with its attainable clinical application has generated nice curiosity amongst medical professionals and general public. Embryonic somatic cell research has become a difficult issue for medicine scientists, policy manufacturers and regulative bodies. The key controversial issue is that the determination of ethical and status of the embryo as embryo somatic cell analysis involves retrieving animal tissue from spare embryos resulting in their destruction. This embryo that has the total capability to grow to be somebody's being is sacrificed for the benefit of others. World laws watching somatic cell analysis also are troubled with similar moral and ethical problems related to it. the most supply of animal tissue is that the spare or supernumerary embryos created throughout physiological condition treatment by artificial generative techniques (ART). Sadly, in absence of regulative provisions to manipulate them, the sphere of ART is open for all kinds of medical malpraxis bearing direct implications on embryonic somatic cell analysis this text is an effort to hunt clarity on the concept of embryonic somatic cell analysis and contentious problems related to it.

Keywords - Stem cells, Potency, Antimicrobial resistance, Stem cell mediated therapy, Genetic defects

1. INTRODUCTION

Stem cell research has promised great therapeutic alternatives for enervating diseases and injuries. Due to advancement of technologies in the field of stem cell research in the recent years, scope of stem cell-based therapies has increased. Some disorders like Leukemia or Corneal disorder, now have stem cell based standard treatments. Speedy research in this field has granted doctors new diagnostic and therapeutic treatments which transcend the risk factors of existing treatments like organ transplant or rejuvenation of tissues ¹. The unethical issue is only hindrance faced by embryonic stem cell research, i.e. in order to research on stem cells; they need to be extracted from embryo which leads to embryo destruction. The very embryo which has capacity to develop into a fully functional human being is destroyed. Any research which violates the human dignity, non-malfeasance or justice is bound to agonize from ethical controversies.

International Journal of Chemical & Pharmaceutical AnalysisJanuary-March 2019





Fig.2: Transmission electron micrograph of a mesenchymal stem cell displaying typical ultrastructural characteristics

Fig. 1: Diseases that can be cured by stem cell therapy

2. DEFINITION AND PLATFORM OF STEM CELLS

Stem cells: stem cells are known to be the master cells of the human's body, which have the unique ability to develop into specialized cell type in the human body ².

Embryonic stem cells (ESCs): Embryonic stem cells are the type of pluripotent stem cells which derived from, inner mass of blastocyst of an embryo (basically within 4-5 days of fertilization) which may be capable of forming all other cells of the body, they are not totipotent cells.



Fig 3: Stem Cells in mitotic stage

Fig. 4: Embryo cell

Adult stem cells: Adult stem cells are undifferentiated cells which are derived from brain, blood, teeth, bone marrow, cartilage, and adipose tissue etc. and found in the body throughout the postnatal life.



Fig. 5: Hematopoietic and stromal stem cell differentiation

Umbilical cord blood stem cells and placental stem cells: These cells are extracted from the umbilical cord and placental tissue is also enriches mesenchymal stem cells.

3. INDUCED PLURIPOTENT STEM CELLS (IPSCS)

IPSCs are the type of pluripotent stem cells which have been generated from adult cells by engineering or reprogramming ³. It is important to note that though IPSC technology as enormous potential, it is still at its infancy, and certainly does not do away with the need for ESCs ⁴.



Fig. 6: Cells that can be reprogrammed from adult somatic cells through transcription factors to become pluripotent

4. SOMATIC CELL NUCLEAR TRANSPLANT (SCNT) CLONING

Nuclear transplant is a form of cloning. SCNT is a laboratory technique in which the ovum is created with the donor nucleus invitro and then transferred into an unfertilized egg cell (basically the genetic material, DNA is transferred). **"Dolly"** the sheep was the first mammal to have been cloned from an adult cell in 1997⁵.



Fig. 7: Somatic Cell Nuclear Transfer (aka- Cloning) The nucleus of the diploid somatic cell is transferred into the de-nucleated egg cell, before implantation of the zygote into a surrogate

5. LEGAL AND CONSTITUTIONAL STATUS OF THE EMBRYO/UNBORN FOETUS

The Universal Declaration of Human Rights (UDHR) in its Article 1 says that: "All human beings are born free and equal in dignity and rights". Inclusion of the word "born" excludes the human rights being granted to foetus and embryo ⁶. An amendment was proposed and rejected that would have deleted the word "born", as it was deliberated to protect the right to life from the moment of conception. Thus, a foetus has no rights under UDHR. The main standard for the protection of human life in general international law is Article 6 of the Covenant on Civil and Political Rights (CCPR). Article 6 of the CCPR, norm prescribes that "every human being has the inherent right to life. However, the phraseology of the norm doesn't outline the term "human being". On interpretation of the above fundamental right, one can simply conclude that the unborn foetus, from the conception till birth, has a right of life and it is immaterial whether the foetus is created in vitro or in vivo.



Fig. 8: Human foetus



Fig. 9: CRISPR embryos and the law

Article 2(1) of the European Convention on Human Rights provides: "Everyone's right to life shall be protected by law." But the conventional language doesn't include the unborn, i.e. foetus isn't regarded as a 'person'. The US Supreme Court has no rules on the constitutional status of embryos outside of the body and most US states have no law on the matter. But the court has ruled that foetuses are not persons within the meaning of the 14th Amendment, and thus do not have constitutional rights as such.

Article 4 of the American Convention on Human Rights states: "Every person has the right to have his life respected. This right shall be protected by law and, in general, from the moment of conception. No one shall be arbitrarily deprived of his life". But the Inter-American Commission on Human Rights has clearly mentioned that this protection is not absolute."

The basic fundamental right to life is guaranteed by Article 21 of the Constitution of India. It says that no person shall be deprived of his life or personal liberty except according to procedure established by law. Even here the term "person" is not defined. The Indian Legal System provides for the protection of the rights of the foetus through sections 312 to 316 of the Indian Penal Code (IPC) which deals with miscarriage. These acts are to avoid death of unborn which is considered equivalent to culpable homicide.

Section 416 of Code of Criminal Procedure (CrPC) Act 1973 provides for postponement of capital sentence of pregnant women and also to commutes the sentence to life imprisonment in such circumstances. This provision is made to protect the life of unborn foetus as it not responsible for the act committed by the pregnant woman. Here the legislation has considered the unborn foetus as a distinct and separate entity with the right of protection against potential harm.

The above-mentioned legal provisions make it clear that the unborn foetus is protected from potential harm similar as the fundamental rights of non-interference with personal life and bodily integrity guaranteed to a human person. If embryos are granted the status of personhood then they too will have the right of not to be killed for research purposes or sex selective abortion.

The lack of clarity on the status of the embryo and deliberations put forth by constitutions of various countries and decision given by competent courts it can be assumed that the foetuses are not considered a person and hence cannot enjoy fundamental constitutional rights meant for human beings or persons. Even Indian constitution is silent on the matter.

6. VALUE OF EMBRYOS

Embryonic stem cell research focuses on stem cell lines. These are populations of cells, all carrying the same genes, grown in the laboratory through many cycles of growth and division over many generations of cells. One cell line can supply lots of researchers with huge numbers of cells. There are three main sources of human embryonic stem cell lines.

Cell lines that already exist.

- Spare embryos left over from fertility treatment.
- Custom-made embryos created by somatic cell nuclear transfer (SCNT), the technique used to create the sheep Dolly

In other words, should we consider them as waste material or treat them as valuable commodity. "For donor couples, the transformation of embryos from intended babies, to 'waste' or 'leftover' material and then finally a source of precious stem cells is a complex and value laden process." ⁸

The transformation of discarded embryos into stem cells has been referred to by one scientist as the process of turning 'garbage into gold'. ⁹ The child intending couples have to make emotional, physical and financial investment to reap the benefits in terms of successful pregnancy though this beneficial outcome cannot be always guaranteed. These lead to illegal selling or buying of embryos.

Using different sources of human embryonic stem cells for research raises different ethical problems. Experimenting on embryos created for in vitro fertilization but left unused, or embryos, created especially for research raise ethical questions. In the first case-whether using "spare" human embryos for research means a lack of respect for the beginning of human life, and in the second--whether creation of embryos for research is morally worse than experimentation on already created, but unused human embryos. The possibility of therapeutic cloning also raises a question whether it is ethical to create human embryos for therapeutic purposes. When balancing the possible benefit of embryonic stem cell research inventing new therapies, and the ethical problems, raised by this research, a question is posed whether there are any equally effective alternatives to research on viable human embryos that could avoid or at least decrease these problems. The aim of this literature review is to present the main arguments for and against using different sources of human embryonic stem cells and to acquaint with possible alternatives to human embryo research.

7. GLOBAL LEGISLATION GOVERNING EMBRYONIC STEM CELL RESEARCH

Legislation governing human embryonic stem cell research is not uniform and varies from country to country. Most of them have allowed use of spare or supernumerary embryos created during in-vitro fertilization for this purpose but have prohibited creation of human embryos specifically for research purposes In a few countries buying and selling of gametes, fertilized eggs, embryos and foetal tissues is banned and considered illegal. But some countries with more liberal view have allowed creation of human embryos for research purposes via SCNT(technique used to create dolly sheep.)In India creation of spare, supernumerary embryos for research purpose is legal with prior approval of the Institutional Committee for Stem Cell research and Therapy (IC-SCRT) and Institutional Ethics Committee (IEC)⁹.

8. NEED OF DEFINITIVE LEGISLATION

India doesn't really have a definite legislation regulating artificial reproductive technologies, due to which there isn't any regulation on production of spare embryos during infertility treatment. The existing guidelines directing stem cell research including embryonic stem cell are prepared by the Indian Council for Medical Research (ICMR). Supervision of ART clinic is necessary to ensure high standards of treatment quality, preservation and disposal of embryos. The rights and autonomy of the

International Journal of Chemical & Pharmaceutical AnalysisJanuary-March 2019

donor couple and donor of gametes should be adequately protected. Informed consent of the donor regarding the use and destruction of the spare embryo should be taken. The question of financial compensation given to them should be adequately addressed keeping into mind the relevant existing rules and regulations of the country. Legislation similarly on the lines of the Human Fertilization and Embryo Act, as prevalent in the United Kingdom, will help to lessen the problems associated with ART ^{10,11}.

9. CONCLUSIONS

The possibilities offered by adult and embryonic stem cells in the treatment of various diseases have created widespread excitement globally. The clinical application of stem cells and its outcome is not yet clear and hence their potential use need to be ascertained by evidence before accepting them as safe and effective treatment. Though stem cell-based therapies are in early stage of clinical development later on they may turn out to be expensive in nature and thus affordable to only wealthy few. This might create social injustice and inequality, and both are in violation of basic principles of clinical research. The challenge is to ensure that it is available to all patients who need them. The issues related to the source of embryonic tissues still lie unresolved and many more are likely to appear especially if non-embryonic sources of pluripotent stem cells become available. The science of medicine is always evolving, and any new scientific discovery is associated with some or the other ethical or legal issue. Ethical issues will remain, but they are the issues that arise in bringing any new discovery out of the lab into clinical research and then clinical use. The more apt and liberal use of ethical and legal principles will help to resolve them and bring these discoveries in reality for the benefit of needy patients.

REFERENCES

- David G Zacharias, Timothy J Nelson, Paul S. Mueller and C. Christopher Hook. The Science and Ethics of induced Pluripotency: What Will Become of Embryonic Stem Cells? Mayo Cli Proc, 2011: 86(7): 634-640.
- Definition of stem cells. Available from: www.medterms.com/script/main/art.asp?article key= 10597. (Assessed on 02 December 2013).
- 3. K.Takahashi and S. Yamanaka. "Induction of Pluripotent Stem Cells from Mouse Embryonic and Adult Fibroblast Cultures by Defined Factors," Cell 126, 2006, 4: 663-676.
- 4. S. Yamanaka. "Elite and Stochastic Models for Induced Pluripotent Stem Cell Generation," Nature. 2009, 460 (7251): 49-52.
- 5. Wilmut I, Schnieke AE, McWhir J, Kind AJ, Campbell KH. Viable offspring derived from fetal and adult mammalian cells. Nature. 1997; 385(6619): 810- 813.
- 6. Yamanaka S, Blau HM. Nuclear reprogramming to a pluripotent state by three approaches. Nature. 2010; 465(7299): 704-712.
- 7. Lori P Knowles. The Use of Human Embryos in Stem Cell Research, Stem Cell Network: Available from: www.stemcellnetwork.ca/uploads/file/whitepapers/The Use-of-Human Embryos.pdf. (Assessed on 04 December 2013).
- 8. Weise E. "Studies show new ways to get stem cells", USA Today, 2005 OCT 16. (Internet). Available from http://www.usatoday.com. (Assessed on 28 December 2013).
- Doerflinger, R. The ethics of funding embryonic stem cell research: A Catholic viewpoint. Kennedy Inst Ethic J 1999; 9(2):137-150.
- House of Lords Select Committee on Science and Technology. Stem cell research2002.Availablefrom:http://www.publications.parliament.uk/pa/ld200102/ldselect/ldstem/83/8301.htm. (Assessed on 07 December 2013).

International Journal of Chemical & Pharmaceutical AnalysisJanuary-March 2019

 Campbell AV. Ethical issues in therapeutic cloning. Round table "Ethical aspects of human stem cells research and uses", Brussels, 26 June 2000. Available from: http://europa.eu.int/comm/european_group_ ethics/docs/dp15rev.pdf. (Assessed on 07 December 2013).