



Justifiability and uses of cloning and embryonic stem cells in the 21st century.

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Introduction

In this day and age, stem cell therapy has become a promising and advanced scientific research topic. Stem cells are cells that can develop into several other types of cells - essentially, stem cells can grow into any cell in the human body. This idea of a miracle cure and bodies healing themselves holds a particular fascination to me. Stem cells bring regenerative medicine a step closer, but many of the ideas and concepts remain controversial. Using human embryonic stem cells (hESCs) raises ethical concerns due to the involvement of human embryos and safety concerns due to limited knowledge and experience. This topic is interesting to me because it has raised conflict in several areas like medicine and religion & culture.

Keeping this in mind, the following report sets out to explore whether using embryonic stem cells is justified in the 21st century. This will be done by analysing and comparing different causes, consequences, and perspectives. Issues will be explored from global and national perspectives, drawing on perspectives from the USA (which has had 136 clinical trials)¹, Hong Kong, and my home country, India, which has been a significant contributor to the global market for stem cells in recent years, is growing at a rate of 15%, according to Dr. Satish Totey.

Issues

The issues I have chosen to focus on are the uses of stem cells in medicine, research (cloning), while highlighting their controversy (ethical & safety concerns), as, after my research, I feel that these are the most significant.

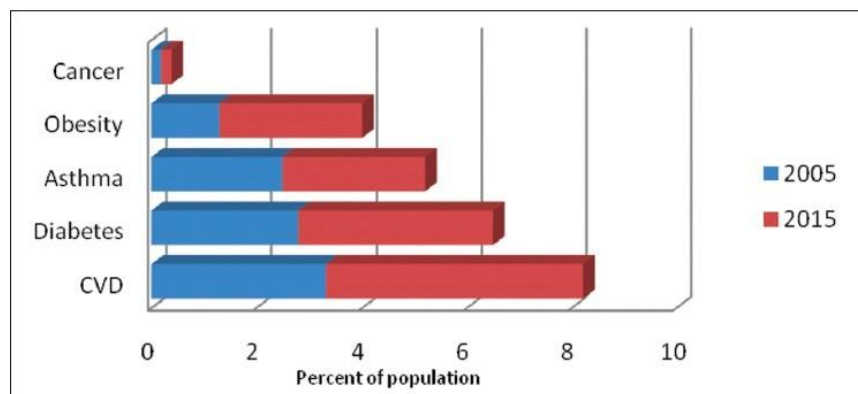
Causes for Using Stem Cells

We can argue that perhaps the greatest use and potential of stem cells in society is in the field of medicine. One reason for this is that the number of chronic diseases has increased uncontrollably, according to The National Centre for Biotechnology Information² and stem cells have the potential to find cures for them. In an enormous country like India, the number of chronic diseases like cancer, cardiovascular disease, dementia increased by

¹<https://www.worldatlas.com/articles/countries-where-stem-cell-research-is-most-popular.html>

²<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5876976/>

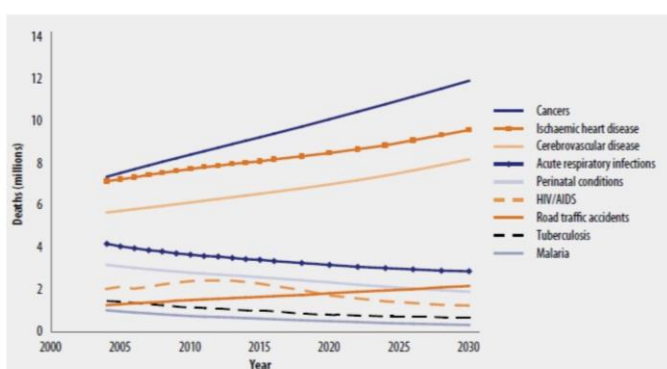
more than 50% from the figures in 2005 to 2015³ and this figure has certainly increased since then; we can correctly assume that people are more at risk of chronic diseases now due to several factors.



According to the World Health Organisation, the Global Mortality Projection from 2004 to 2030 is estimated to increase by 60% for diseases such as cancers, heart diseases, and brain diseases⁴.

The NCBI states, "Trends show an overall increase in chronic diseases."⁵ We can conclude that the world is at more risk of fatal chronic diseases than ever.

Global Mortality Projections, 2004 to 2030



DukeMedicine

WHO Global Burden of Disease 2004 Report

DUKE GLOBAL HEALTH INSTITUTE

Stem cell therapies have significant potential to treat traumatic injuries and serious diseases since stem cell therapies have an overall success rate of 60 to 80% in India and the USA.

Consequence (Medicine)

According to research by the University of Nebraska, stem cells can be effectively used to treat cardiovascular diseases, diabetes, brain diseases, cell deficiency diseases and even tissue regeneration for amputees and burns victims, and vision/hearing loss⁶.

As stated by the NCBI, the use of insulin-producing stem cells to cure diabetes is expected within the next 6–10 years, the treatment of cardiovascular diseases with stem cells is seen as one of the first and most realistic applications of stem-cell therapy. As a result, experts hypothesise this treatment to be widely available in the

³https://www.researchgate.net/figure/Prevalence-of-chronic-diseases-in-India-By-disease-y-axis-and-percent-of-population-x_fig1_259354000

⁴<https://player.slideplayer.com/25/8147420/#>

⁵<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5876976/>

⁶<https://www.unmc.edu/stemcells/educational-resources/importance.html>

next few years. Moreover, the alleviation of Parkinson's disease globally by implanting stem cells into the brains of patients is also expected to be widely available within the next 6–10 years.⁷

Ethical & Safety Concerns (Medicine)

However, there are concerns posed by these stem cell therapies. Currently, the only stem cell products that are FDA-approved for use in the United States consist of blood-forming embryonic stem cells⁸. These cells only aid the body in fighting infection, transporting oxygen and blood clotting. According to the FDA, none other stem cells are proven to work optimally to be able to treat severe conditions - some may even cause harm such as tumour-formation and life-threatening blood infections⁹.

The Indian Council of Medical Research has issued multiple guidelines for careful moderation. These recognise stem cell therapies only for certain treatments and state that other types of treatments are unapproved and should not be offered as therapy. 'It is regarded as unethical and is a violation of the National Guidelines for Stem Cell Research if a hospital claims to offer stem cell therapy for all diseases' says Dr Mehak Advani who is an MD physician in Mumbai, India.

Despite this, the chances of stem-cell therapy being used to reduce cardiovascular or metabolic diseases, or to reduce the need for organ transplantations, are highly welcomed by the experts. The majority expect their widespread application within the next 6-10 years¹⁰.

Consequences (Research)

Embryonic stem cells are cryopreserved to a temperature of -40°C. My aunt and uncle cryopreserved some of their son's stem cells so that these can be used in the future if needed to grow new cells in a laboratory to replace damaged organs or tissues and to research causes of genetic defects in cells, thereby improving quality of life. Various studies suggest that even after 23 years of cryopreservation, stem cells show no degeneration and still remain fully viable, which is a very important development showing potential of stem cells in research and counters beliefs of inefficiency. This can augment usage in clinical trials which is very significant for several medical advancements.

Consequences (Cloning)

Frozen stem cells can help to allow researchers to produce identical cells that maintain the desired characteristics. This enables researchers to produce identical copies of tissues and organs which have potential to eradicate disabilities and can also result in treatment of diseases. Scottish researchers cloned a sheep, Dolly, to genetically modify it to produce milk containing human proteins essential for blood clotting¹¹.

The most significant advantage of using cloned tissues is that they are all genetically identical allowing researchers to carry out fair tests and change conditions as per their requirements. The FDA believes that there

⁷ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1299161/>

⁸ <https://www.fda.gov/consumers/consumer-updates/fda-warns-about-stem-cell-therapies>

⁹ <https://www.fda.gov/vaccines-blood-biologics/consumers-biologics/important-patient-and-consumer-information-about-regenerative-medicine-therapies>

¹⁰ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1299161/>

¹¹ <https://www.britannica.com/topic/Dolly-cloned-sheep>

is evidence of potential and has granted researchers to use cloning methods to make copies of tissues with desirable traits to use in research¹². The credibility of the FDA makes this research acceptable, and prospective.

This research could lead to significant global development, medical advancements, decreasing chronic diseases along with increasing life expectancy; this is very significant for developing countries such as India.

Ethical & Safety Concerns (Cloning)

Most cloned embryos cannot develop healthily. For instance, Dolly was the only clone to survive out of a total of 277 cloned embryos. The most significant concerns are low efficiency and the death of a large number of embryos that would otherwise be born as individuals presenting serious obstacles to the application of stem cells in cloning. Due to religious faith and morals, this leads people to object to this research, believing that creating embryos and destroying them violates respect for life and is tantamount to murder. This is the most significant consequence as this puts researchers at a disadvantage, since they are opposing people's beliefs and religious values, which is closely linked to debates over abortion. This affects the situation gravely as it could lead to a shortage of embryos, volunteers, compliance, and funds donated for research - leading to possible failure of this research.

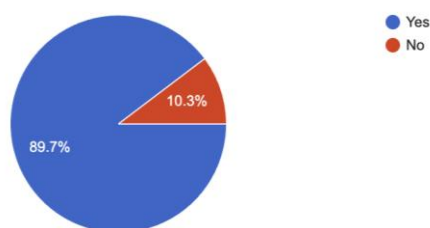
Global and National Perspectives

Dr. Charles F. Thomas, from the US, opposing this research, says that 'In the case of a human embryo being destroyed, there is no benefit. Physicians need to support life in all instances, especially the most vulnerable in society.'

Others, contrarily, believe that the embryo becomes a person in a moral sense at a later stage of development. Conforming to a survey I sent to doctors, professors, parents, students, and experts prominently from the USA, India and Hong Kong, 89.7% of respondents believe that stem cell research will be effective. Surprisingly, close majority of 52.6% believe that an embryo has the same moral status as an adult - clearly showing the difference of opinions.

Do you think cloning and stem cell research can prove to be helpful and effective in terms of curing diseases and regenerating limbs?

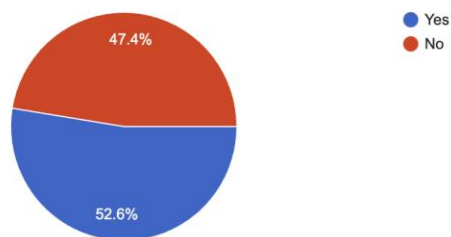
78 responses



¹² <https://www.genome.gov/about-genomics/fact-sheets/Cloning-Fact-Sheet>

Do you believe that an embryo (one cell in the process of development into a baby) is a person with the same moral status as an adult/a live-born child?

78 responses



Due to this conflict, globally, the NIH created guidelines for stem cell research (2009) stating that stem cells from embryos created by in-vitro fertilisation can be used only when the embryo is no longer needed and only when consent is provided. Barack Obama, during his presidency, encouraged this research. 'Development in the US would attract collaborative work and access to an expanded scientific knowledge base in India,' says KV Subramaniam, President of RLS, supporting this research due to its global consequences. Furthermore, Dr. Mehak Advani, has had 7 patients in 2021 who donated embryos and stem cells. In India, many clinical trials are ongoing in Mumbai and Delhi, funded by Government agencies like ICMR, DBT, DST. As of 2021, there have been 1000 clinical trials on stem cells, across the globe.

Approximately 60% of experts expect surplus embryos to be used as a source of stem cells within the next 10 years¹³ and as per Mayo Clinic (an NGO), stem cells research is currently being conducted to find cures for people suffering from diabetes, Parkinson's, amyotrophic-lateral sclerosis, Alzheimer's, heart-disease, burns, cancer, and osteoarthritis¹⁴. So, we can clearly see that the majority of experts believe this research to be promising and support it.

Courses of Action

To ensure maximum productivity, countries like the US should fund advertising this research, leading the public to be familiarised and more supportive. I have learned that there are a lot of safety concerns which give rise to ethical concerns, hence, there should be laws for preventing unauthorised, unapproved usage to prevent any danger such as damage to cells or even death.

Additionally, this topic should be addressed more and taught at school to spread awareness and education so that youth realise the benefits of these therapies. This will lead to more people funding this research, volunteering, and donating. Lastly, the US has started providing consent forms to people signing up for clinical trials which assures protection of rights and welfare of human subjects, making it more likely for people to volunteer in clinical trials due to guaranteed safety and effectiveness.¹⁵

¹³ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1299161/>

¹⁴ <https://www.mayoclinic.org/tests-procedures/bone-marrow-transplant/in-depth/stem-cells/art-20048117>

¹⁵ <https://imcwc.bpl.fyi/html5-blank/stem-cell-informed-consent/>

Source Evaluation

The collected information is of different reliability. Most of the sources are recent (2016-present), containing names of authors, agencies, dates of publishing and editing - this gives it credibility, recency, reliability. I have used data from reputed organisations: FDA, NIH, governments, MayoClinic, University of Nebraska, Academy of Medical Sciences, & interviewed experts for their opinions giving the information authority, relevancy. This makes sure that the information is accurate, fact-checked and makes it likely to trust and favour the arguments. However, some data is not reliable due to included advocacy & potential bias - MayoClinic, and some doctors against the NIH are likely to provide information leaning to a specific perspective. Certain websites, including 'Closerlookatstemcells.org' lacked authenticity, clarity, did not mention names of authors/qualifications or affiliations, and did not have expert backed-up information, leading to it being untrustworthy. However, I used it in order to get unfiltered opinions of the local citizens.

Personal Perspective & Conclusion

I have achieved the determined objectives of this paper by examining global, national perspectives from various sources.

To conclude, my perspective has changed, attributable to the research I have conducted and the information I have obtained. While I initially favoured stem cell research unequivocally, now hold a middle ground and today I understand the ethical and safety concerns and believe that embryos deserve special respect as potential humans but, it is acceptable to use them for certain types of research provided there is credible scientific justification, guaranteed safety to prevent destruction of life, informed consent from the donors for donating the embryo for research to prevent ethical concerns. Hence I conclude that, cloning and using embryonic stem cells is justified in the 21st century since, due to research, I have learned that it has potential to cure diseases, improve health, reduce healthcare costs, stimulate the growth of the biotech sector, and generate tax revenue which leads to a country's development¹⁶.

Individuals and governments, therefore, must cooperate and work together to make stem cell therapy safe and feasible.

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¹⁶ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4117007/#:~:text=From%20just%20a%20few%20institutes,goal%20of%20stem%20cell%20research%3F>

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