Editorial

A summary of ethical aspects of genetic engineering for humans

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Abstract

The science and art of altering genetic material with the aim of enhancing desirable features and removing undesirable traits is genetic engineering. This can be somatic and germline editing. When scientists are going to meddle with the germline this is natural to raise many eyebrows from the society, which is more or less, still believes that some matters must be left to God. But if we see the potential benefits of this research which seems to be vast and which can remove the sufferings in the society, a voice naturally comes from the conscience that why we should stop this. This research and clinical applications seems to be double edged weapon and naturally in such cases we need to apply our mind in depth so that there are no deleterious effects on the society with the advancement of genetic engineering.

Keywords: Genetic engineering; ethics; gene editing.

Introduction

Human Genetic engineering is the thoughtful manipulation of the genes for enhancement of the human beings (1). This editing may help prevention of diseases and result in a better health (2).

This may be possible at pre-implantation stage or in an adult. If screening is done at preimplantation stage genetic counseling can be given so that parents can decide not to have a child with genetic disorders (3).

If it is missed at the preimplantation stage or child is born with genetic disorders, then diseases like hemophilia or cystic fibrosis can be corrected by somatic genetic engineering. Not only this, some acquired diseases which may not have any medical cure may be possible to be cured by research on somatic genetic engineering (3). Somatic genetic engineering has the benefit that such changes in the genes will not passed to the next generations though, If performed, it may have positive or negatives psychological effects on the individuals (4). There are less ethical issues with the somatic genetic engineering. Recombinant DNA technology used with retro viruses are comparatively safer and have much potential benefits and its use should not be held back (5).

Germline editing or modifications are changes in the genes that can be inherited by children (6). Editing of germline has been considered dangerous which cannot be accepted ethically (7). Genome editing will be irreversible process which will pass on the next generations and some such changes may become apparent later on which may be dangerous (8).

No doubt genetic engineering in gene line modifications will result in improvements in the life and health of the human beings but such projects may be considered morally discredited, but for the generations to come it may be a good alternative to have a good health (9).

Though germline gene editing has ethical problems the author favors to carry it further as harms are less and the benefits are more. Risks are manageable and reasonable in this procedure both for single gene and multiple gene disorders and are strongly against any ban on this research as it will prevent the future benefits to the humanity based on research on this technique (10).

Newer technique is 'Clustered Regularly Interspaced Short Palindromic Repeat System (CRISPR/Cas9)' and a lot of ethical concerns are raised by the newspapers about genetic engineering (7). This technique has a power which is cheap and safe (11).

There are many issues involved in gene editing e.g. sanctity of human genome, embryo ethics as embryos cannot give the consent, germline gene editing; Reproduction versus research, when germline editing will be inherited in the future generations and risks involved (2).

The community of science may need a guide about their social responsibility in the fields of genetic engineering in the processes like gene editing which can change and spread a trait in the whole population (12).

For Catholics Ejik has concluded after studying two aspects of genetic engineering i.e. DNA recombinant technology or molecular genetic engineering and cellular genetic engineering that to have genetic engineering in gametes is good but genetic engineering in a fertilized is against the catholic norms and does not favor it (13).

Clustered Randomized Interspersed Palindromic Repeat has made it possible to use non-human primates for genetic engineering especially for brain disorders like depression but here is a strong opposition as animal welfare is concerned and there are other methods by which it can be done (14).

Gene editing technology in which DNA is either replaced, removed or added into a gene (1) if used on wild animals will result in animal sufferings and there is no prediction that this suffering of wild animals will definitely reduce suffering in others. therefore to guard the ecosystem wild animal suffering must be justified before such experiments are allowed and the well-being of the animal is taken care of (15).

There are many diseases caused by mosquitoes and there are successes to reduce the population of the particular type of mosquitoes by gene engineering but there are ethical objections that we should not finish one type of species as it violates the rule of the sanctity of life and it shows degrees of hubris which may be unacceptable (16).

Selection of the army person by using the genome testing may result in loss of diversity of army units in the USA. Enhancing warfighters may be good but valid questions are there that what will happen when such persons are released from the army and moreover there is a limited appeal for selection in the army using this technique (17).

Genetic engineering may be used to produce a child which may be used for organ donations and on the face of it will raise many moral issues and ethical dilemmas (18). Gene editing may also be used for gene doping for improvement in performance of athletes and players, which will become very difficult to detect (4).

Transhumanism encourages the use of the emerging technologies for the benefit of the humankind and greatly favors the genetic engineering (19).

Genome editing for reproduction is not a favored idea but gene therapy is comparatively preferred and safe as it has less of ethical issues with almost a consensus that uniform regulations should be throughout the world (20). There is a danger that designer babies may be produced not necessarily for improving the health but to have some specific desired features in the babies (4).

Discussion of ethical issues is very important as ethical issues may be different for different cultures and such discussions will help to frame policies so that everything in this new concept becomes unchallenged ultimately (4). In a meeting of scientists in Washington DC in 2015 it was decided that it is good to have research on somatic as well as germline editing but this procedure should not be used for pregnancies (7).

Gene editing usage may decide the ethical issues whether it is being used for treating the disease or enhancing a feature, though it may not be easy to separate the both (7). Germline editing for research purposes is getting more credibility (11).

First gene editing case in an embryo was published in 2015 and then an urgent need was felt to regulate this technique (11). There have been discussions saying that there should a moratorium on gene editing in humans till policies are discussed, drafted and finalized (7) (11). Transparency in research was violated and there is a question mark on the safety of the procedure used in this case and was as un necessary medical intervention (21). Others are of the view that there should not be moratorium but a check and monitoring should be done with adequate safeguards should be there before clinical application of this advancement and genetic enhancement was not be allowed at all (11).

Till we do not know completely the effects of gene editing we will not be able to decide the ethical problems and their solutions (7).

Nicholas is strongly in favor of human enhancement and reproductive freedom and favors liberal eugenics (22). Liao has claimed 4 principles of genetic engineering which apparently looks very good that no child should be produced which do not have all fundamental capacities, and if such is created should it be brought to full term, fundamental capacity should not be removed and lack of some fundamental capacity should be corrected if it can be afforded (21). Different people can have different moral status on any issues (23).

American Society of Human Genetics in 2017 on genome editing held the view that till ethical issues are not sorted out germline gene editing should not be done with the purpose of having a pregnancy though research on it should not be banned and in vitro research should be allowed to be carried on and funds should be provided for the same. Future clinical application should be carried out only if there is no ethical issue, procedure is transparent and a strong medical rational for this (24).

By 2019 FDA in USA has approved five products which can be used for somatic gene therapy (25) which has taken care of the ethical issues for somatic gene therapy but barred that government money cannot be used for germline gene therapy research but allowing the funds for somatic gene therapy (25).

CRISPR, Cryo-electron microscopy (which can visualize at atomic level) and advanced computing models are helping the people working on genetic engineering and making the research easy and fast (26).

There are divergent views on the different aspects of genetic engineering. A relatively newer concept should be carefully debated and adopted so that society is not deprived of the potential benefits of a new concept but taking care of that it does not harm the society at large.

Conclusion

There have been great advances in the genetic engineering since it started but it is not a smooth run as it faces ethical controversies and confrontations. There may be risks if we do it and there may be consequences if we do not do it and we will have to weigh the ethics of proceeding or not proceeding in the research.

In the stages of experimentations, we should try to focus on the specific ethical issues in that particular research rather than raising ethical issues about the main process of genomic editing in the embryos.

We must respect the status of human embryos who themselves cannot give consent but all stakeholders must be consulted when drafting the policies on the ethical issues. We should not forget the human rights which must be taken care of when drafting such policies and using these policies.

Some unknown effects or changes may occur in the genetic line which may not be desirable, and long-term repercussions will only be apparent with the passage of time so we travelling in an unknown territory therefore we need to tread cautiously.

Conflict of Interest

None

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