

a) Identify a specific opportunity for the application of the selected technology and explain why it is important (200-250 words)

In the longer term, CRISPR¹ germline editing could give us the ability to change certain traits, or even give genetic advantages to people, such as increased IQ or stronger muscles. However, this is an application of CRISPR that is not easily feasible, due to insufficient knowledge about the structure of the genome (Bosley et al. 2015). Using CRISPR could help remove inherent genetic diseases, improve the quality of people's lives and save money spent in healthcare. However, it could also have an unprecedented negative impact on society, and should be treated carefully.

CRISPR is a biotechnology used for modifying the genome, to either insert or remove certain genes. The advantage of CRISPR over other genetic engineering techniques is that it can be used on living cells, resulting in a wider range of possible applications. Germline genome editing, using CRISPR on male sperm cells or immature female egg cells, allows us to edit the human genome before birth (Zhou et al. 2020).

There are certain diseases caused by 'faulty' genes that could be treated by CRISPR. For example, certain genes increase the probability of type 1 diabetes, or allow HIV viruses to bind to human cells (Zhou et al. 2020). One of the simplest applications of CRISPR would be the removal of such genes, which could be done even before birth. This is something that Professor Naldini, from the San Raffaele Telethon Institute of Genetic Therapy, already calls "in reach" of current technology and CRISPR (Bosley et al. 2015).

¹ CRISPR stands for clustered regularly interspaced short palindromic repeats, a family of bacterial and archaeal systems for defence against foreign DNA sequences, which was repurposed by us for gene editing (Knott and Doudna 2018).

b) In the context of a), demonstrate with the use of relevant evidence how social, ethical and/or legal issues may influence the development of technical solutions by EECS professionals (200-250 words)

The main social constraint which may arise with the development of human germline editing is the deepening of social inequalities. Even though the technology is not yet available for clinical use, it will most likely not be equally accessible for every social group. Furthermore, germline gene therapy is essentially 'playing God' in its modifying of genes. It is inevitable that some parents will use this technology to create their 'perfect babies' (Zhou et al. 2020). Allowing the technology to be abused in this way will reinforce prejudice in society and it could be argued that this is a version of eugenics, the view that we should improve the genetics of the human race (Ormond et al. 2017). This is comparable to the forced sterilization of "undesirables" which reached its peak during the regimen of Nazi Germany (MU School of Medicine, 2020). Moreover, everyone involved in nascent technologies are stakeholders, so the fact that the embryos submitted to this technology have no say is a violation of their lack of choice (Ormond et al. 2017).

Because of these moral concerns, embryonic gene editing is illegal in most countries in the world. This cautionary approach is due to the fact that we cannot predict how these germline modifications affect future generations (Krekora-Zajac 2020). This will slow down the development of GMOs ascribed to the limited amount of experiments that scientists may research on, but these measures are here for the safety of the posterity.

Bibliography

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Include a description of the situation:

BabyGent, a startup company primarily offering Preimplantation Genetic Diagnosis (PGD), is at the same time conducting additional research studies on CRISPR. Specifically, they research genetic modification of animal embryos. Dr. Hinks is the principal research scientist of BabyGent's research division, owing to his experience in genetic modification. BabyGent owes the majority of its market share to his research on improving the safety of PGD.

Dr. Hinks however, thinks that CRISPR could be the future of genetic modification and modern healthcare. Therefore, he wants to include human subjects in his experiments on embryonic modification. Luckily for him, at this time came a young, freshly married couple who wanted to perform PGD of their embryos for in vitro fertilization. During the procedure, it was found out that the embryos would suffer from genetic blindness. Unbeknownst to the cadre of BabyGent, Dr. Hinks told the parents their company offers a new package solving these issues, and they agreed to modify the embryos using CRISPR. The procedure went well and the embryos were cured of the disease.

The baby ended up growing well in surrogacy, and was born healthy and with normal eyesight. However, due to the experimental nature of the procedure, the baby had to be monitored by Dr. Hinks for the rest of its life for any unforeseen consequences. The parents were happy and satisfied with the procedure, and the main company of BabyGent never found out anything. This convinced Dr. Hinks to attempt such procedures in the future.

Include an analysis of the situation:

By not telling the parents about all the details of the procedure and lying about the package offered by his company, Dr Hinks broke principle 2.5 of the Code of Ethics, requiring to give evaluation of impacts and possible risks. Since a procedure like this was performed for the first time on a human subject, the doctor cannot be sure about all the risks, and by experimenting without the knowledge of his employers and clients, he violates the Code of Ethics.

Throughout the life of the embryo, it will be subject to testing to monitor the effects of this new kind of experimentation. While it could be argued that the parents had a right to make a decision in service of their child, acceptance to such an invasive way of living is bound to frustrate the human product of a PGD procedure. The lack of consideration on the child's behalf conflicts with the Code of Ethics 1.1, which acknowledges all people as stakeholders, and in this case, the main stakeholder.

Furthermore, this testing will undoubtedly make it feel it has fewer privacy privileges than a typical citizen, breaching principle 1.6 of the Code of Ethics. Although these tests are in the baby's best interest for its physical health, it is not so attentive to its mental health. It will realise that groups of scientists monitoring everything it does is nothing but a discourteous invasion of privacy that it did not ask for.

Team Contribution Statement

Assignment Number: 1

Group Number: 14.2

Write the name of each of your group members in a separate column. For each person, indicate the extent to which you agree with the statement on the left, using a scale of 1-4 (1=strongly disagree; 2=disagree; 3=agree; 4=strongly agree). Total the numbers in each column. **Include a completed and signed Team Contribution Statement in your group submission file.**

Evaluation Criteria	Kenneth Aiden Martin	Maja Kostacinska	Marta Misztal	Rafee Ahmed	Amir Hadzic	
Attends group meetings regularly and arrives on time.	4	4	4	4	4	
Contributes meaningfully to group discussions.	4	4	4	4	4	
Completes group assignments on time.	4	4	4	4	4	
Prepares work in a quality manner.	4	4	4	4	4	
Demonstrates a cooperative and supportive attitude.	4	4	4	4	4	
Contributes significantly to the success of the project.	4	4	4	4	4	
TOTALS	24	24	24	24	24	

Feedback on team dynamics:

1. How effectively did your group work?

Very effectively. Everyone participated actively, discussed on group meetings and worked on time.

2. Were the behaviors of any of the team members particularly valuable or detrimental to the team? Explain.

The behaviors of the entire team were particularly valuable and not detrimental to the team. Everybody did their part and everybody worked equally well.

3. What did you learn about working in a group from this project that you will carry into your next group experience?

That we work well together. Planning and regularly meeting is important, along with making plans early.

Team Names and signatures

1. Kenneth Aiden Martin
2. Maja Kostacinska
3. Marta Misztal
4. Rafee Ahmed
5. Amir Hadzic

We the team members have discussed and agreed the ratings and comments given above.

Diploma

This is to certify that

Kenneth Aiden Martin

has completed the course

Find It! Use It! Reference It! QMUL
Information Literacy Skills

741296

Diploma

This is to certify that

Maja Kostacinska

has completed the course

Find It! Use It! Reference It! QMUL
Information Literacy Skills

951056

Diploma

This is to certify that

**Marta Weronika
Misztal**

has completed the course

**Find It! Use It! Reference It! QMUL
Information Literacy Skills**

538528

CERTIFICATE of ACHIEVEMENT

This is to certify that

Rafee Ahmed

has completed the course

Find It! Use It! Reference It! QMUL Information Literacy Skills

CERTIFICATE of ACHIEVEMENT

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Amir Hadzic

has completed the course

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