

Designer babies

Introduction

This activity explores the meanings of the term 'designer baby'. It provides a review of the techniques and the issues associated with the application of genetics to human reproduction. Students align themselves across the room according to their opinion and then justify their position.

Activity 1 A questionnaire

This activity is a simple survey of the class to answer the questions "If you could design your baby what would you choose?" Collect results on the board for discussion.

Activity 2 The line

Give students the sheet and the glossary, if you think they need it. Give them a few minutes to read and to think about their own position. In some classes there will be questions and clarifications needed at this stage.

Then, making sure there is enough space, draw an imaginary line from A to L across the room and get all students to take up a position corresponding to the furthest intervention in human reproduction on the list that they think is acceptable. There may also be dispute about the ordering of the interventions. This could stimulate useful discussion.

When everyone is in position get each student to pair up with someone who is one letter higher or lower than themselves and give them 5 minutes to try to change each other's mind. Then let them locate themselves on the line again and see if there are any changes. This may be an opportunity to talk about the role of debate for decision making.

Have a general discussion in which some students feed back their reasons for choosing a particular limit to intervention. Total time 30 - 45 minutes.

How science works

Hh Some new technologies and new areas of scientific research raise ethical issues. That is to say, they raise questions about whether a particular action is right or wrong.

Hi Decisions and opinions on ethical issues are based on values. An individual's view on an issue may be based upon a religious or moral position.

Hk A utilitarian approach is to argue that the right decision or choice is the one that leads to the greatest good for the largest number. It can also be argued, however, that some actions are wrong, even if they lead to good outcomes.

Hi Scientists have an individual responsibility to ensure that their practice is ethical. This may be detailed in a professional ethical code. Such codes may also form the basis of regulatory decision by ethics committees.

Science explanations

Ce Most characteristics are determined by an interaction between several genes as well as by the effect of the environment. The environment can influence gene expression.

Cf In addition to the variation which arises through sexual reproduction, change can occasionally happen to a gene itself. This is called mutation. If a mutated gene happens to be in a sex cell, copies of it can be handed on to an offspring, perhaps giving it new characteristics.

Cg Cloning is a way of making a genetically identical copy of an organism.



Designer babies

Part 1 What would you choose?

- If it were possible would you want to 'design' your baby?
- If you could design your baby what would you choose? You can't, but many people think that one day it will be possible. Would we all choose the same features or would people be as varied as ever?

Choice 1

Do you want to choose at all; such choice means that conception becomes a medical procedure; would you rather conceive your child in the normal more pleasurable and less intrusive way and love whoever you get?

Choice 2

Assuming you do decide to go ahead and choose your child's features what would you choose?

sex	male	female	
height	tall	average	short
colouring	fair	dark	
attractiveness	very beautiful	average	
intelligence	very intelligent	intelligent	average
personality	lively	generous	calm

Choice 3

Is it worth the risk? Your carefully 'designed' child might not turn out the way you had planned. Might you then love them less?

Part 2 What choice should we allow?

There is an element of design in all babies. The list below shows all the techniques which have been, or might one day be used. How far down the list do you think the term "**designer babies**" starts to apply? If you do not understand all the terms used see the glossary below.

Consider the list as a line representing us interfering more and more in what sort of baby is born. Decide how far down the line you think interference is acceptable. Walk down the line until you get to the procedure that is the limit for you. Stop there

When the whole class is lined up talk to the person who has gone one stage further or less far than you. Explain to each other why you have stopped where you are. Can you persuade them to move one position?

Technique	Comment
A Choose a partner “you would want to have children with”.	The normal procedure.
B IVF for infertility, the “best” embryo, the one most likely to develop, is implanted	A subjective choice by the technician based on experience
C Genetic screening of potential parents. If both are found to carry a defective gene they may be advised not to have children together.	Used to prevent birth of babies with Tay Sachs disease and other recessive genetic conditions.
D Sex selection by PGD on an IVF embryo. If the fetus is at risk from an X-chromosome linked genetic disease only female embryos are implanted the male ones are destroyed.	Duchenne muscular dystrophy is an example of an X-linked genetic which therefore only affects boys
E PGD on an IVF embryo for couples who carry a genetic disease. Only embryos without the genetic disease are implanted the rest are destroyed.	A single cell removed from each embryo is genetically tested, mainly for the specific disease mutations known to be carried by the parents.
F Amniocentesis or CVS on a developing fetus at about 3 - 4 months. Abortion if the embryo is found to suffer from a genetic disease.	The most widely used technique for prevention of the birth of babies with genetic diseases
G Use of PGD on an IVF embryo to select an embryo a few of whose cells will, at birth, be able to be used to cure a seriously ill brother or sister.	This has been used several times in families where one child needs a matched transplant to survive.
H Abortion of a developing fetus found to be the “wrong” sex.	Widely practiced in some cultures, though not normally legal.
I Use of PGD on an IVF embryo to select an embryo with ‘normal’ genes, and discard those with genes that increase the risk of heart disease or mental illness.	More and more genes are being found which may increase the risk of disease, though none cause it directly unless other factors are also present
This is as far as we have gone so far. But the ideas below are all likely to happen in the future	
J Use of PGD on an IVF embryo to select an embryo that carries genes known to be linked to intelligence, beauty or sporting prowess.	Such genes have not been found yet but research continues.
K Genetic manipulation of the developing fetus in vitro to introduce genes for particular characteristics. or are deformed.	Has been done on animals although the success rate is low and many others die early. But techniques are getting better.
L Clone a human using DNA from the cell of someone you want your child to be like. Idea appeals to those wishing to recreate a loved one or for infertility.	Has been done on animals with very low success rate and many deaths and deformities. But techniques are getting better.

Definitions

Amniocentesis	The amniotic fluid which surrounds the developing fetus in the uterus always contains a few cells shed by the fetus. If a little of this fluid is withdrawn from the uterus the cells can be screened for gene or chromosomal defects.
Clone	To create another person with exactly the same genetic material. Identical twins are clones, as are plants taken from cuttings. The nucleus is taken from a cell and inserted into a human egg, from which the nucleus has been removed. This egg can sometimes be shocked into dividing as it would after fertilisation.
Embryo	The early stage of development of a baby before the cells have differentiated into different functions.
Fetus	The developing baby in the uterus until it is born. Also spelled foetus.
Genetic Manipulation	It is possible to introduce genes into a cell nucleus. Sometimes these genes become part of the cell's chromosomes and function normally. It is hoped that the normal genes will take over the function of a defective gene such as the CF gene which causes cystic fibrosis.
Genetic Testing	DNA is extracted from the cell, usually it is then copied by special enzymes. The DNA can then be matched to standard DNA samples to see whether it is normal or not.
IVF	In Vitro Fertilisation; literally means fertilisation in glass and is often popularly known as "test-tube babies". The woman is given hormones to make her ovulate with several eggs at once. These are removed by micro-surgery and each egg is fertilised by sperm in a petri dish. After a few cell divisions the "best" embryo is implanted in the uterus. Sometimes the embryo implants in the uterus lining and a normal pregnancy continues. IVF has a success rate of about 20%.
PGD	Preimplantation Genetic Diagnosis; when the fertilised egg has divided to an embryo of about 8 cells one of these can be removed without harming development. The DNA in this cell can then be replicated and tested for specific defects. If a defect is found the embryo is discarded, those without the defect can be implanted in the uterus as with any IVF treatment. See textbook p91-92
X-chromosome	Females have two X-chromosomes so any defect on one will not be expressed. Because males have only one X-chromosome, and one Y-chromosome, they will be harmed by a defect on their X-chromosome.