<table>
<thead>
<tr>
<th>Benefits</th>
<th>Risks</th>
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<tbody>
<tr>
<td>Will help reduce global food shortages</td>
<td>Will impact on the local ecosystem</td>
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</table>

What can we do? Make crops grow faster and bigger
What can we do?

Make crops resistant to diseases

Benefits
Will reduce the use of chemical pesticides

Risks
Could have unintended consequences on food safety
What can we do?

Make crops resistant to pests

Benefits
Will reduce the use of chemical pesticides

Risks
Could have unintended consequences on food safety

BIOCHEMICAL SOCIETY

British Society for Gene & Cell Therapy
What can we do?

Make crops that can survive drought

Benefits
Will protect us from some of the effects of climate change

Risks
Will impact on the local ecosystem
What can we do?

Make crops that can live in salt water

Benefits
Will allow crops to be grown even when there are rising sea levels

Risks
Will impact on the local ecosystem
What can we do?

Use algae to create biofuels

Benefits

Will be a source of renewable, carbon neutral fuel

Risks

May slow development of other green energy sources
What can we do?

Use bacteria to create drugs and medicines for human use

Benefits
Can produce drugs cheaply and on a large scale

Risks
Could affect wild bacteria if not controlled carefully
What can we do?

Use bacteria to create materials and chemicals for use in industry

Benefits
Able to produce new materials, cheaply and quickly

Risks
Could affect wild bacteria if not controlled
Adapt animal organs so they can be transplanted into people (xenotransplantation)

**Benefits**
Will provide organs for people who need transplants

**Risks**
Could have unintended consequences on health
What can we do?

Research human health and disease in a lab by editing human cells

Benefits
Can help develop cures for diseases and help us understand how our bodies work

Risks
Human cells in a lab may not act the same as cells in the body

BIOCHEMICAL SOCIETY

British Society for Gene & Cell Therapy
What can we do?

**Benefits**
Uses a patient’s own blood cells to help fight the disease

**Risks**
Could have unintended consequences on health which would be difficult to reverse

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**Edit white blood cells to treat HIV**

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**BIOCHEMICAL SOCIETY**
What can we do?

Stop children getting cystic fibrosis by editing an embryo

Benefits
Cures the disease

Risks
Any mistakes or errors would be passed on to the patient’s children
What can we do?

Edit embryonic genes to reduce the risk of getting a disease

Benefits
May reduce the likelihood of getting a disease

Risks
Other factors may be involved and may lead to less cautious behaviour
What can we do?

Make athletes stronger and faster

Benefits
Would make the Olympics awesome

Risks
Only the richest countries would win

BIOCHEMICAL SOCIETY

British Society for Gene & Cell Therapy
What can we do?

Make fruit and vegetables that have better nutritional content

Benefits
Could help reduce deficiency diseases in many areas around the world

Risks
Could have impacts on the local ecosystem and unintended safety issues
Create chickens that only produce female offspring to increase egg production

Benefits
Would make eggs cheaper and more plentiful

Risks
Is creating an artificial population
What can we do?

Make hornless cattle that can be kept in a confined space

Benefits
Makes it safer to house cattle in a high density

Risks
Encourages cruelty to animals

BIOCHEMICAL SOCIETY

British Society for Gene & Cell Therapy
What can we do?

Create more docile animals that are easier to keep

Benefits
Makes farming easier and safer

Risks
Could have unexpected consequences on food safety
What can we do?

Edit mosquitoes so that they cannot transmit malaria or Zika virus

Benefits
Could prevent mosquitoes spreading these diseases

Risks
Once released, would be almost impossible to stop and could have unintended consequences
What can we do?

**Benefits**

Would stop them spreading disease

**Risks**

Mosquitoes are food for many other animals, so would affect the food chain

Edit mosquitoes so that they cannot reproduce and therefore the population is wiped out.
What can we do?

Reintroduce an extinct species

Benefits
Would be really cool

Risks
Watch Jurassic Park

BIOCHEMICAL SOCIETY

British Society for Gene & Cell Therapy
What can we do?

Let people do genetic experiments at home

Benefits

Would help people learn about molecular bioscience and increase innovation

Risks

They could create dangerous bacterial strains
What can we do?

Edit people to protect them against chemical warfare

Benefits

Would protect people from the effects of war

Risks

Could cause a biological arms race
What can we do?

Produce biological weapons

Benefits
Cheaper to manufacture

Risks
Indiscriminate mass destruction

BIOCHEMICAL SOCIETY

British Society for Gene & Cell Therapy
What can we do?

Make crops that are resistant to warmer global temperatures

Benefits
Would help reduce global food shortages caused by climate change

Risks
Could have unintended consequences if cross-bred with natural varieties

BIOCHEMICAL SOCIETY

British Society for Gene & Cell Therapy
What can we do?

- **Benefits**: Could make detergent more effective at lower temperatures, therefore saving energy.
- **Risks**: Could impact on the environment in waste water.

Edit bacteria so that it can produce enzymes for use in laundry detergent.
What can we do?

Create mice with cancer so that we can study how to cure it

Benefits

We already do this, but it will now be easier and quicker

Risks

Encourages greater use of experiments on animals
What can we do?

Make extra hairy goats to make them better at producing wool

Benefits

Would increase wool production, making clothes cheaper

Risks

Is it cruel to the goat?
What can we do?

Give cows bigger muscles to make more meat

Benefits

Cheaper and more plentiful meat could help reduce global food shortages

Risks

Could have other impacts on the cow’s health

BIOCHEMICAL SOCIETY

British Society for Gene & Cell Therapy
What can we do?

Make grass for golf courses that doesn’t need weed killers

Benefits

Reduces use of chemical herbicides

Risks

Could create a strain of super grass that cannot be stopped
What can we do?

Risks
Should we breed animals just for our own amusement?

Benefits
They’d be so cute!

Make tiny pigs to sell as pets
What can we do?

Treat inherited eye diseases and blindness

Benefits
Could restore people’s sight

Risks
Could have unintended safety issues

BIOCHEMICAL SOCIETY

British Society for Gene & Cell Therapy
What can we do?

Edit human embryos to study what causes miscarriage

Benefits
Would increase our knowledge and safety during pregnancy

Risks
Requires the use of human embryos
What can we do?

Re-sensitise bacteria to antibiotics

**Benefits**

Would reduce the antibiotic resistance crisis

**Risks**

Could spread to other bacteria that we need to survive – the microbiome
What can we do?

Cure sickle cell anaemia

Benefits
Cures a nasty disease

Risks
Sickle cell anaemia actually has some benefits in certain populations, for example protecting against malaria
What can we do?

Create rice which has extra vitamin A

Benefits
Could help people who do not get enough vitamin A in their diet

Risks
Could have impact on food safety and the local ecosystem
What can we do?

Edit embryos to reduce the risk of getting breast cancer

Benefits

Could reduce the number of people getting breast cancer

Risks

Changes would be passed on down to children and could have unintended consequences

BIOCHEMICAL SOCIETY

British Society for Gene & Cell Therapy
What can we do?

Edit embryos to reduce the risk of becoming overweight

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<td>Could reduce obesity</td>
<td>People may take it as an excuse to eat more food and less healthily</td>
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[Image of a person measuring their waist]
What can we do?

Edit bone marrow cells to cure leukaemia

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<td>Cures leukaemia</td>
<td>Could have knock-on effects on other aspects of health</td>
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What can we do?

Create mice without a particular gene to discover what it does

Benefits
We can learn a lot about human health and disease

Risks
Requires keeping mice and often killing them
What can we do?

Insert a human gene into a mouse to study the immune system

Benefits
Can help us treat human diseases and find new cures

Risks
Requires keeping mice and often killing them

British Society for Gene & Cell Therapy
What can we do?

Use animals to produce enzymes for people who don’t have them

Benefits

Could provide insulin for diabetics, cheaply and on a large scale

Risks

Requires the containment of animals

BIOCHEMICAL SOCIETY

British Society for Gene & Cell Therapy
What can we do?

Make fluorescent pets

Benefits

Would make great Christmas presents

Risks

Involves adding jellyfish genes into the animal, therefore creating a genetic hybrid