

# Visions of the future – Part II: Biotechnology

by Rainer Jacob



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Biotechnologie – Verheißung oder Fluch? Können wir damit eine bessere Zukunft schaffen, den Hunger in der Welt besiegen, unheilbare Krankheiten heilen, Gendefekte reparieren? Dürfen wir den Zufall in der Evolution ausschalten, Gene verändern, die Charaktereigenschaften und äußere Erscheinung von Embryonen im Labor vorherbestimmen, Designerbabys und perfekte Übermenschen erschaffen und das Leben verlängern? Diese und weitere Fragen stellen sich angesichts der aktuellen Fortschritte in Biotechnologie, Gentechnik und Gentherapie. Die Lernenden erfahren und diskutieren Anwendungsmöglichkeiten, Errungenschaften und künftige Entwicklungen der Biotechnologie und Gentechnik in Industrie, Landwirtschaft und Medizin. Zudem erkennen sie Grenzbereiche und setzen sich mit damit verbundenen ethischen Fragen auseinander.

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## Competences and skills:

In this unit students gain knowledge on scientific and ethical aspects of biotechnology. They enhance their **vocabulary** and strengthen their **reading skills** as they work with several texts. Students demonstrate their **viewing** and **listening skills** when engaging themselves with videos and movies. By completing research tasks, they acquire additional **media competences**.

## Overview:

### List of abbreviations:

<b>A</b> Analysis	<b>C</b> Comment
<b>CT</b> Creative Task	<b>D</b> Discussion / debate
<b>G</b> Group work	<b>L</b> Language
<b>LVC</b> Listening / viewing comprehension	<b>M</b> Mind map / visualising
<b>P</b> Working with a picture / cartoon	<b>PR</b> Presentation
<b>R</b> Research	<b>RC</b> Reading comprehension
<b>S</b> Summary	<b>T</b> Working with a text
<b>VI</b> Working with a video	<b>W</b> Writing

Topic	Material	Methods/Skills
1: Biotechnology – introduction	M1–M2	C, M, R, RC
2: Genetic engineering	M3	L, LVC, R, VI, W
3: Gene therapy in real life	M4–M5	A, L, LVC, R, RC, T, VI
4: Gene editing	M6–M9	C, D, G, L, P, RC, T, W
5: Human cloning in literature and film	M10–M14	A, C, CT, D, G, PR, RC, S, T, VI, W

## Topic 1: Biotechnology – introduction

### M1 The application areas of biotechnology



One of the most advanced disciplines of scientific research today is biotechnology, the branch of molecular biology that studies the use of living organisms (especially microorganisms). A colour code system is being used to distinguish the various fields in which biotech is applied. For example, blue refers to biotechnology in the exploitation of sea resources, yellow in food production. The most promising and at the same time often controversial application areas are medicine (red like blood), agriculture (green like plants) and – less well-known – in industry (white).

#### White biotechnology: Industry

White biotechnology, also known as industrial biotechnology, refers to the application of the technique in industrial processes. Living cells from yeast<sup>1</sup>, moulds<sup>2</sup>, bacteria, plants and enzymes are used to produce useful and safe chemicals, for example for the manufacture of biodegradable<sup>3</sup> plastics or clothes from plants (a T-shirt from corn sugar). White biotechnology can help to replace polluting technologies, save energy and reduce waste in production processes.

#### Green biotechnology: Agriculture

Agriculture profits greatly from the use of genetic engineering techniques to increase food production and secure food supply. A procedure referred to as “genome<sup>4</sup> editing” modifies the genes of plants and makes them more resistant to pests, diseases and the vagaries<sup>5</sup> of climate change. In traditional farming, weeds, diseases or insect pests damage crops and cause devastating agricultural losses which cause hunger and malnutrition in fragile developing economies. In addition, agricultural biotechnology can also help to enrich plants with nutrients so that crops contain more iron, vitamin A and protein and can make up for vitamin deficiencies and raise health standards in many regions.

Due to the obvious advantages of genetically modified crops, agriculture in the United States relies to a great extent on the cultivation of engineered soybean, cotton or corn. In American supermarkets, the range of GM foods – including pizza, chips, cookies, ice cream, salad dressing, corn syrup, and baking powder – is on a steady increase. In contrast to American consumers, Europeans have reservation against food containing ingredients from modified plants. Genetically

## M5 Worksheet – *British woman is first in the world to undergo gene therapy for most common form of blindness*

### Pre-reading activity



1. Watch the YouTube-video. How does Marc's impairment influence his life? [https://raabe.click/um\\_en\\_going\\_blind](https://raabe.click/um_en_going_blind) [last access: 09/12/2020]



### Reading comprehension



2. Read the article. Tick the correct answer (true / false) and quote from the text to support your decision. Write down the line(s) plus the first three words and the last three words of the quotation(s).

Statement	True	False	Evidence
Mrs Osborne was undergoing surgery because she was blind.			
She had great difficulty managing her daily life.			
Mrs Osborne is a rather egoistic person.			
She worries about being a burden on her family.			
The operation is dangerous because a virus is used.			
The procedure must be repeated at regular intervals.			
Up to now, AMD cannot be prevented or cured.			
Gene therapy is meant to correct an overreaction of a patient's immune system.			
Thanks to gene therapy, a person's eyesight can be restored.			
However, it will take a long time for the treatment of AMD to be successful.			

## M11 Worksheet – Mary Shelley's *Frankenstein*

### Pre-reading activity



1. The film version of Mary Shelley's novel *Frankenstein* was a huge commercial success in 1931 and initiated a series of sequels and adaptations. Why do people, young and old, like to be scared? Discuss.

### Reading comprehension



2. Summarise the excerpt.

#### How to write a summary

A summary is the clear, concise and orderly concentration of a text. You should reduce the contents of the original to one-third or one-fourth.

- Read the original thoroughly.
- Answer the question, "What happens?"
- Leave out descriptions.
- Use the present tense (simple form).
- Do not copy from the text – use your own words.
- Do not use direct speech: Change direct speech into reported speech.
- Do not add your opinion or interpretation.

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### Working with the text



3. Explain the function of the narrative technique in this excerpt.
4. Analyse the narrator's attitude and reaction to his experiment.
5. Interpret the excerpt and relate it to today's discussions (hopes and fears) about human cloning.

### Composition



6. While studying in Ingolstadt, Victor Frankenstein is told by one of his professors, "The labours of men of genius, however erroneously directed, scarcely ever fail in ultimately turning to the solid advantage of mankind." Explain and discuss this statement in a written text. Also take into consideration what you have learned in this unit so far.