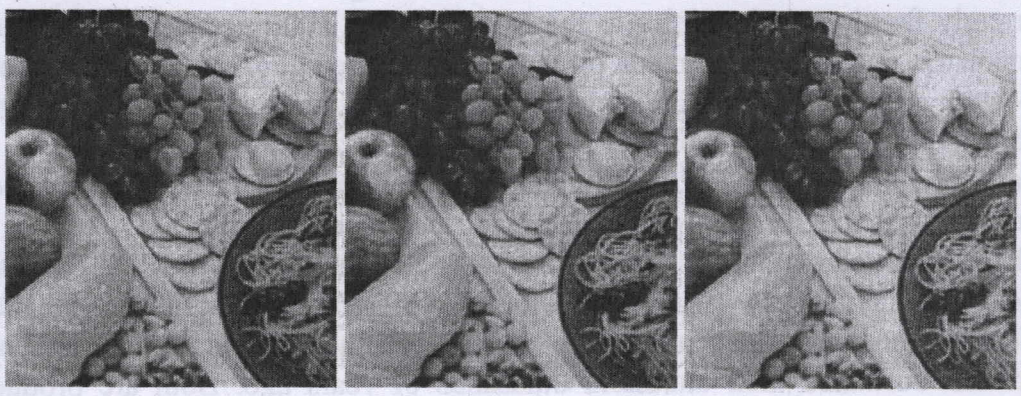
THE ORIGINS OF BIOTECHNOLOGY



[1]

1.1. Fill the gaps using the words in the box to answer this question.
What is biotechnology?

change • is • make • living • use • the

Biotechnology _____ _____ _____ of _____ things to _____ or _____ products.

1.2. What examples of both applications of biotechnology do you know? Discuss the question with a partner.

1.3. Can all the products in the pictures above be the result of biotechnological process? What do you think?

1.4. Try to match the following phrases

1) raw	a) foods
2) perishable	b) meat
3) brewer's	c) foods
4) malted	d) yeast
5) staple	e) enzyme
6) bread	f) preservatives
7) spice	g) grain
8) digestive	h) dough

[2]

1.5. Read the first part of the text entitled: 'Ancient art or modern science' and answer the following questions.

1. How did early farming communities in the Middle East make beer?
2. What is still used nowadays to make bread dough rise?
3. How were sausages made by the early civilizations?
4. What happens when milk is stored in vessels made from goats' stomachs?
5. What bacterium yields yoghurt?

Ancient art

The word 'biotechnology' is modern, but humans have been using biotechnology to produce some of their staple foods and favourite beverages since the dawn of civilisation.

In early farming communities in the Middle East 10 000 years ago, people ate bread for sustenance, and drank beer made by fermenting malted grain or barley bread steeped in water – with a little help from invisible friends. Baker's yeast still creates the bubbles that cause bread dough to rise; and brewer's yeast puts the fizz into beer.

Early civilizations quaffed wine made from grape juice fermented spontaneously, by yeast and bacteria that form the waxy bloom on ripe grapes.

They preserved perishable foods like fruit and vegetables by pickling them and made sausages by fermenting raw meat mixed with spice preservatives, as salami is made today.

Nomadic herdsmen in central Asia still rely on the same staple diet of cheese and yoghurt that sustained their ancestors thousands of years ago. Both are products of an ancient biotechnological practice that probably pre-dates agriculture.

When milk is stored in primitive vessels made from goats' or calves' stomachs, it curdles in the presence of the digestive enzyme, rennet. *Lactococcus* and *Lactobacillus bacteria* then take over, transforming the curd into cheese. Whole milk fermented by *Lactobacillus* yields another dietary staple – yoghurt.

In ancient times, the processes that transformed simple raw materials into tasty, nutritious foods must have seemed magical. We now know the answer was biotechnology, in the form of friendly, fermenting microbes.

(adapted from *www.csiro.au*)

Language review

Look at the sentence which comes from the text:

They preserved perishable foods like fruit and vegetables ***by pickling*** *them.*

1.6. Use these clues to make similar sentences as in the Language review box above.

1. In the Middle East/ they/ make/ beer/ use/ barley grain.

   _____

2. Our ancestors/ make/ cheese/ store/ milk/ vessels/ make/ goats' stomachs.

   _____

3. You/ obtain/ salts/ neutralize/ bases and acids.

   _____

1.7. Now using the structure from the Language review box and from exercise 1.6 talk about things in life which are done by means of something else (consider biotechnology, cooking and other processes).

1.8. Read the second part of the text entitled: 'Ancient art or modern science'. Parts of the sentences have been removed from the text. Choose from a–e the one which fits each gap 1–4. There is one extra sentence which you do not need to use.

a) to complex multicellular organisms like plants and animals
b) use them for our own needs and for the benefit of the environment
c) they drank beer for pleasure
d) biotechnology has changed from an art into a modern science
e) that allow them to colonise most environments on land

Modern science

Biotechnology harnesses the special biochemical talents of living cells, from simple, single-celled bacteria and yeasts, _____ **(1)**, for human benefit.

Agriculture itself can be regarded as a form of biotechnology – over thousands of years, humans have chosen animals and plants from the wild and gradually transformed them into today's familiar, highly productive crops and farm animals by selecting types with useful qualities.

During the past century, _____ **(2)**. To the small list of microbes used by our ancestors to make their food, scientists have added thousands of new species and many more await discovery.

Over 3.5 billion years of evolution, microbes have acquired a vast repertoire of biochemical skills _____ **(3)**, in the oceans, even the deep rocks of the Earth's crust. We are just beginning to appreciate their extraordinary capabilities and _____ **(4)**.

Today, biotechnology is indispensable to our health and wellbeing. Every society on earth uses and depends on it in one form or another.

(adapted from *www.csiro.au*)

Language review

To be indispensable to something means to be vital, to be very important, and that you cannot do without it.

Today, biotechnology ***is indispensable to*** *our health and wellbeing.*

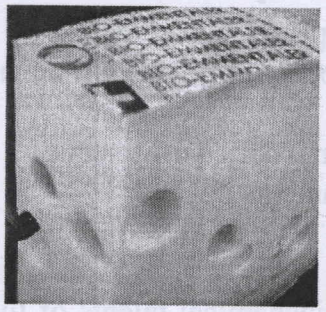
The word **indispensable** can also be followed by a **for + verb + ing** structure:

Meat is not ***indispensable for maintaining*** *a healthy diet.*

1.9. Try to create four sentences containing the word 'indispensable' in biotechnological context using the two structures from the box.

1.10. Can you think of how you take advantage of biotechnology in your everyday life?

Use the picture prompts to help you and think about other examples apart from food and drink. Discuss the question with a partner.


[3]

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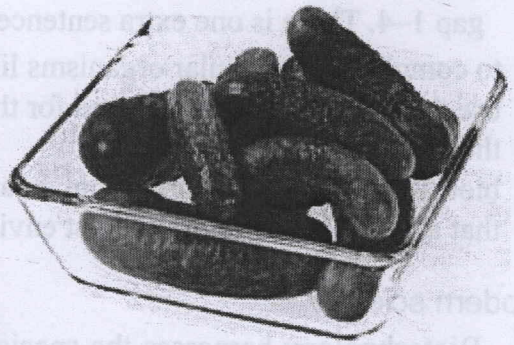

[5]

1.11. Read the text about another application of biotechnology. Use the word given in capitals at the end of some of the lines to form a word that fits in the gap in the same line.

Dealing with waste

Around the world, modern sewage _____ **(1)** works rely on complex, mixed colonies of microbes to rapidly break down organic material into gases and nutrient-rich sludge. **TREAT**

In Australian capital cities, _____ **(2)** occurring microbes are used to convert buried organic wastes in municipal rubbish tips into clean-burning gas to generate _____ **(3)**. Some rubbish dumps recycle food and garden wastes by bulk-composting, using the same fungi and bacteria found in garden compost heaps. **NATURAL** **ELECTRIC**

Many food-processing factories, dairies and piggeries now _____ **(4)** pollution and cut energy costs by recycling their organic wastes and manure through digester tanks to produce gas for power generation or heating. **MINIMAL**

A new technology, bioremediation, employs special microbes to clean up soil on former _____ **(5)** sites contaminated by fuel, oil, pesticides or industrial wastes. **INDUSTRY**

Mining companies are using microbes to prevent acid runoff from ore piles and old spoil dumps contaminating groundwater and waterways. They are also using bio-leaching to mobilise and extract metal _____ **(6)** and efficiently from sulphide ores. **CHEAP**

(adapted from *www.csiro.au*)

1.12. In the text above find the words which correspond to the following definitions.

1. _____ the mixture of waste from the human body and used water that is carried away from houses by pipes under the ground.

2. _____ the solid substance that is left when industrial waste has been cleaned.
3. _____ a place on a farm where milk is kept and butter and cheese are made.
4. _____ the use of biological agents, such as bacteria or plants, to remove or neutralize contaminants, as in polluted soil or water.
5. _____ mineral or an aggregate of minerals from which a valuable constituent, especially a metal, can be profitably mined or extracted.
6. _____ the dissolution of metals from their mineral source by naturally occurring microorganisms, also known as biooxidation.
7. _____ a chemical used to kill pests, especially insects.

1.13. Do companies in Poland deal with the waste in the way described in the text in exercise 1.11?

What examples of the biotechnological approach to dealing with the waste can you find in Poland? Use the vocabulary from exercises 1.11 and 1.12 to talk about it with your partner.

1.14. Listen to some information about the origins of biotechnology. For questions 1–5, choose the answer (A, B, C or D) which fits best according to what you hear.

1. Brewing contributed as much to the gross national product as steel
   A in late 19th century in Germany
   B in late 18th century in Germany
   C in early 18th century in America
   D in late 19th century in America
2. Carlsberg Institute was founded
   A in 1785
   B in 1875
   C in 1758
   D in 1857
3. The person who grew yeast on an immense scale during World War I was
   A Chaim Weizmann
   B Emil Christian Hansen
   C John Ewald Siebel
   D Max Delbrück
4. Károly Ereky raised
   A pigs
   B cows
   C sheep
   D deer
5. Emil Siebel established
   A Institute of Biotechnnology
   B Bureau of Biotechnology
   C Bureau of Zymotechnology
   D none of these

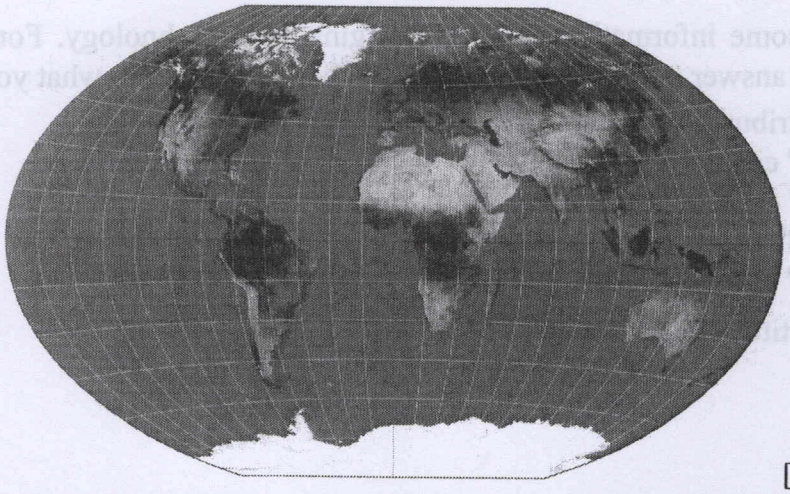
1.15. Read the extended definition of Biotechnology. Discuss with a partner which aspects of the science are the most interesting and in which you would like to specialize in the future.

Biotechnology is the use of biological systems – living things – to make or change products. It includes both traditional biotechnology such as baking bread, brewing beer and making cheese, and modern biotechnology (also called gene technology) that includes the discovery of genes (genomics), understanding gene functions and interactions (functional genomics), use of DNA markers and genetic modification, which includes controlling gene activity, modifying genes and transferring genes.

(adapted from *www.dairyfuturescrc.com*)

1.16. Do you think this is a full definition of biotechnology? What would you like to add to it? Discuss these two questions in groups of two or three.

1.17. If you could choose to study biotechnology in any country in the world, which country would it be and why? What do you know about biotechnological policy of this country?



[6]

1.18. At a seminar organized for secondary school pupils interested in studying biotechnology you are asked to briefly introduce the idea of biotechnology to them. Prepare a short introductory speech (about 100 words) covering the areas of biotechnology discussed in the chapter together with your own ideas so that the pupils would have a general idea of what biotechnology deals with.

1.19. Work in groups of three. One person reads the speech aloud, the others prepare two additional questions for the author of the speech. When the questions are successfully answered, change roles and repeat the activity in the same way until all three speeches have been read and all questions answered.

GLOSSARY

baker's yeast – drożdże piekarskie
brewer's yeast – drożdże piwowarskie
beverage – napój
contaminate – skazić
curd – zsiadłe mleko
curdle – zsiąść się

dairy – mleczarnia, mleczarski
digestive – trawienny
dough – ciasto
fizz – gaz, bąbelki
grain – zboże, ziarno
harness – wykorzystać
indispensable – niezbędny
malt – zaprawiać słodem
manure – nawóz pochodzenia zwierzęcego
multicellular – wielokomórkowy
municipal – miejski
ore – ruda
perishable – psujący się (o towarze)
preservative – środek konserwujący
quaff – pić łapczywie
sewage – ścieki
sludge – muł
staple food – podstawowe pożywienie
steeped in – przesiąknięty
sustenance – wyżywienie
vessel – naczynie
yeast – drożdże
yield – uzysk, plon, wynik