



# The Essential Guide To **Biotechnology**

**Ensuring Quality of Life**

# What is **Biotechnology?**

Biotechnology is the use of technology on biological systems and living organisms to create or develop different products that can improve our overall quality of life.





# Did You Know?

- 1 **99.9%** of all human DNA is exactly the same. It is only **0.1%** that makes each of us unique.
- 2 Humans actually share **98%** of their genes with chimpanzees, **92%** with mice, **76%** with zebrafish, **51%** with fruit flies, and **18%** with *E. coli* bacteria.
- 3 Some of your genetic material actually doesn't come from you. In fact, viruses and bacteria can insert their DNA into your genes through horizontal gene transfer (HGT).
- 4 DNA is also called the "information molecule" because of its ability to pass on genetic information from one cell to another.
- 5 There is currently an ongoing movement to ban and avoid genetically modified foods (GMOs) through agriculture practices.



# Colours of Biotechnology

Biotechnology is actually presented in 4 colours: **Blue, Red, Green, and White.**

## 1 Blue Biotechnology

The colour of the ocean and refers to the study of bodies of water.

## 2 Red Biotechnology

The colour of blood and refers to the Red Cross symbol and medical field.

## 3 Green Biotechnology

The colour of plants and refers to the study of agriculture.

## 4 White Biotechnology

Studies have been conducted on the implementation of bioprocesses in industries, such as the manufacturing of pharmaceuticals using microorganisms.

# Career Prospects



Here are some of the career options to choose from after you've graduated in Biotechnology:

- Epidemiologists
- Genetic Counsellors
- Wildlife Biologists
- Microbiologists
- Biochemists & Biophysicists
- Biological Technicians
- Medical Scientists
- Director of Product Strategy
- Biomanufacturing Specialists

# Main Areas Of The Biotechnology Industry

Medicine •  
Environment •  
Agriculture •  
Food •



# Medical Biotechnology



Medical biotechnology is the practise of using living cells and other organisms to find cures, prevent disease, and furthering research purposes to understand the biology of the human system. One technique used here is the study of DNA (Deoxyribonucleic acid, an individual's genetic make-up) for personalised medicine – precise diagnosis, prevention and treatment.

# Environmental Biotechnology



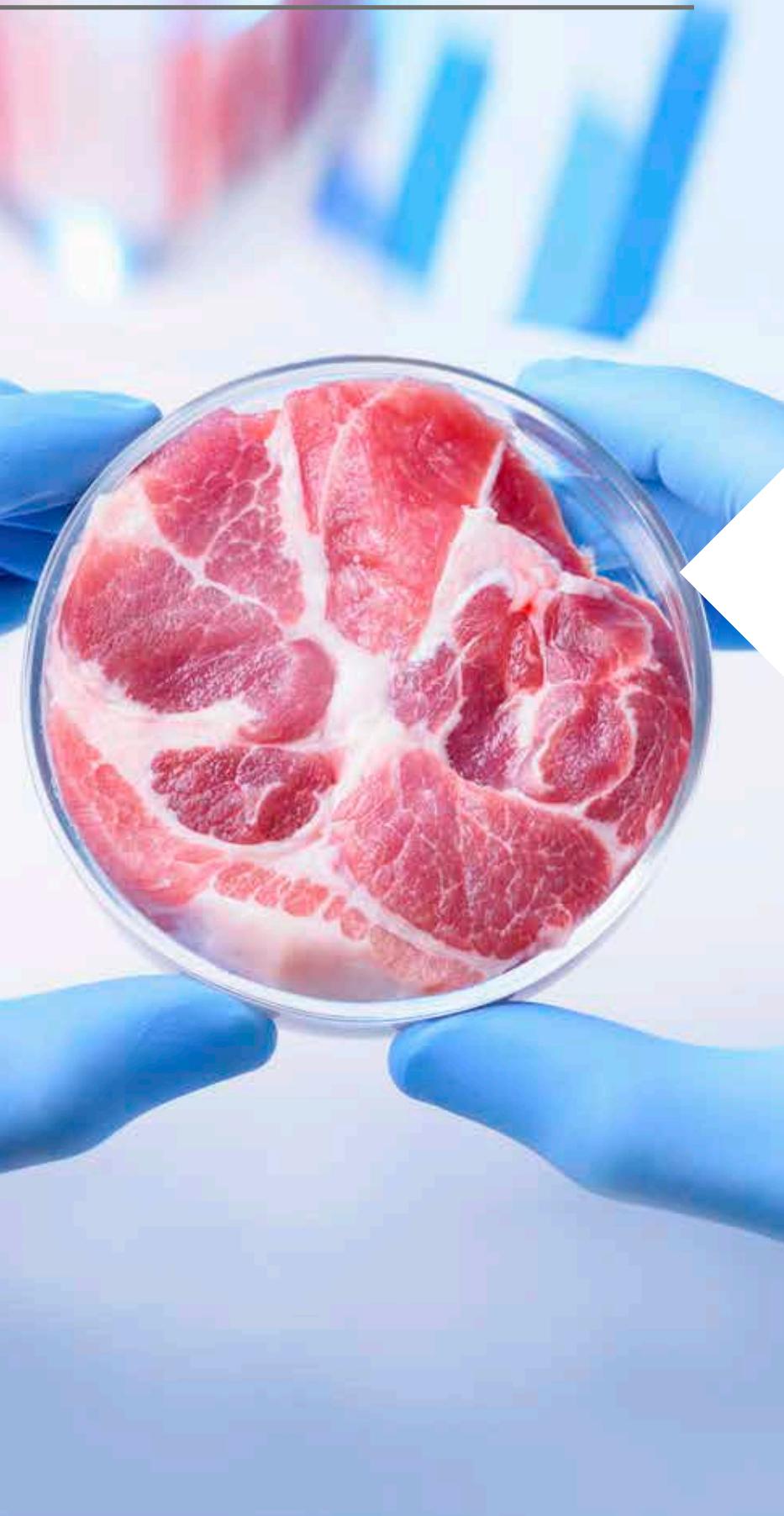
Environmental Biotechnology is a branch that addresses the issues of **environmental pollution** through advanced processes such as biotechnological treatments on waste. Another sustainable breakthrough is the use of renewable biofuels to decrease greenhouse gases and reduce our dependence on oil.

# Agricultural Biotechnology



Agricultural Biotechnology addresses zero hunger issues and works on ensuring food security. It involves the development of genetically enhanced plants to introduce beneficial characteristics to the crops, which leads to a higher yield. In some cases, they also practise selective breeding in animals as well, which involves choosing the most desirable traits to breed offsprings that yields sustainable attributes.

# Food Biotechnology



Food Biotechnology uses and **manipulates** the genes from plants and animals to enhance taste, improve quality, nutrition, and processing of food. This role is incredibly beneficial in reducing malnutrition, food-related diseases, and starvation in under developed countries.



# Biotechnology Industry in **Malaysia**

The government has launched a bioeconomy initiative to further develop our agriculture, healthcare, and industrial manufacturing sectors.

- Malaysia established its own bioeconomy initiative named BIOECONOMY TRANSFORMATION PROGRAMME (BTP) in 2012, being the second in Asia to do so after China.
- Bioeconomy refers to all economic activity derived from the continued commercial application of biotechnology in the country.
- In 2010, the bioeconomy sector as a whole contributed to 13.4% of the Malaysia Gross Domestic Product (GDP), according to eduspiral.com. This was seen to be of equal value to RM106.7 billion.
- Today, the size of Malaysia's entire bioeconomy sector is projected to grow to RM149.1 billion in 2020 and RM181.2 billion in 2030.
- The BTP is also targeted to contribute RM48 billion of Gross National Income in 2020 and promote an additional 170,000 job opportunities.

# Know Your Roles



## 01 Epidemiologists

Epidemiologists research and compile data to understand the cause of diseases to improve public health issues through conducting various experiments, interviews, and analysis of data.

## 02 Genetic Counsellors

Genetic Counsellors assist families to check for risks of inherited diseases, conditions, or defects. They then provide advice to the individuals concerned with the risk of inherited conditions and how to treat it.

## 03 Wildlife Biologists

They study animals and wildlife in the ecosystem while observing their interactions with other animals and the impact of humans on their natural habitat.



## 04 **Microbiologists**

Microbiologists focus on the functions of tiny organisms in human bodies, plants, or water bodies and conduct complex research on these microscopic cells. Through their findings, it can be used to develop new ways to produce new drugs to combat diseases.

## 05 **Biochemists and Biophysicists**

They perform various tests for their ongoing research related to the study of DNA, proteins, and molecules to test drugs' effects on a person's biological system.

## 06 **Biological Technicians**

Biological Technicians help scientists carry out their experiments by preparing research samples, prepping the equipment and lab for use, run tests, and record data for future use.

## 07 **Medical Scientists**

Medical Scientists specialise in researching biological systems to understand and treat diseases. They apply their findings by conducting experiments, preparing their own research hypothesis, investigate existing drugs and its effect on diseases.

# The Future Of Biotechnology

**New Amazing Discoveries:**

- Genome Editing •
- Food Engineering •
- Human Augmentation •
- Pharmacogenomics •



# Genome Editing

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**DNA** is inserted, deleted, or modified in an organism's genome to produce desirable qualities.

This technology can be used in the future to improve a person's capabilities such as enhanced night vision or sense of smell. It can also treat ailments that were previously untreatable, or remove a particular unwanted trait completely.

# Food Engineering

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A close-up photograph of a kiwi fruit slice. A 3D printer head is positioned above the fruit, with a layer of white powder or ink being applied to the surface. The background is blurred, showing a blue surface.

To reduce the impact of carbon emissions and environmental pollution, this sector has been aiming to create food using cutting-edge technology to grow meat through gene modification of cells.

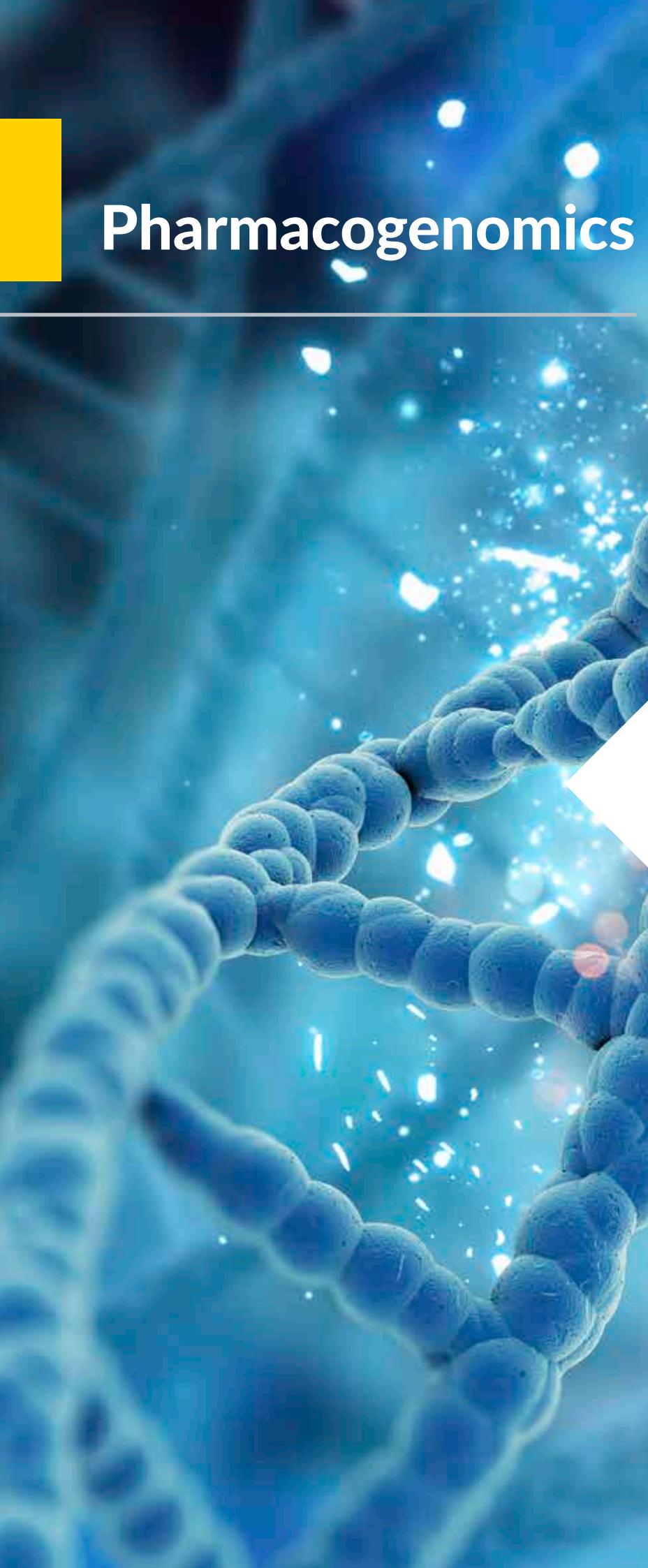
# Human Augmentation

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Imagine having all kinds of online information stored in your brain, ready to be accessed at any time. In fact, Elon Musk is one of the pioneers working to integrate the human interface with **Artificial Intelligence**.

# Pharmacogenomics



**A process to determine how a patient's genetic profile will affect their response to a particular medicine. In the future, tests can be run to predict which patient will benefit from a specific medicine, guaranteeing full recovery.**

# You Should Take Biotechnology If..

## 01 You are fascinated by science

The many of life's complexities do not scare you — rather, you have developed an interest in it and want to know the details that make a biological system tick. You are especially intrigued by the chemistry and biology of science.



## 02 You love doing research and have an interest in it

Do you feel completely at home tinkering in the lab with all your equipment and data? If it is, then you have found your calling. Running experiments and noting down your findings is an exciting process for you, and you can't wait to run back to the lab to make new discoveries. Most research and development work requires you to have either a Master's or PhD qualification.



## 03 You have a passion for knowledge

You have a natural curiosity on how the world operates around you. This unlocks a driven purpose to explore new things, but your thirst for knowledge will definitely be kept busy here as you learn about new scientific discoveries every day.



## 04 You want to help save lives

Stepping into the world of biotechnology will grant you the ability to be at the frontline of global healthcare involving new medicine that will not only help save lives, but completely transform them. You might even get to contribute to some of the leading fields in medicine, such as vaccine production and gene modification.



# What's In A Biotechnology Programme?



- Cell Culture Techniques
- Bioinformatics
- Techniques In Molecular Biology
- Agricultural And Industrial Biotechnology
- Marine And Environmental Biotechnology
- Molecular And Medical Biotechnology
- Genetics
- Microbiology
- Cell Biology
- Organic Chemistry
- Biochemistry
- Business Administration



**Nilai University offers a Biotechnology programmes that combines multidisciplinary principles of each sector to provide a well-rounded academic learning experience for the student.**

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Watch the video  
 Biotechnology