

# FDE 330

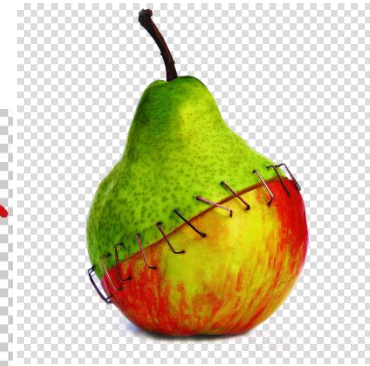
# FOOD BIOTECHNOLOGY

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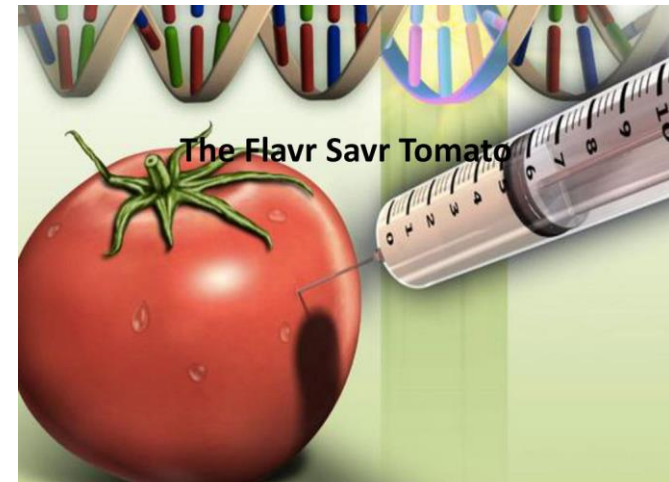


# Course Content

- I. Recombinant DNA Technology
- II. Bioprocess: Biotransformation

# I. Recombinant DNA Technology

- ▶ The Definition, History and Main Areas of Application of Biotechnology
- ▶ Food Biotechnology
- ▶ Nucleic Acids
- ▶ Genetic Recombination
- ▶ Gene Cloning Methods
- ▶ Recombinant DNA Technology
- ▶ In vitro DNA Replication



## II. Bioprocess: Biotransformation

- ▶ Bioprocess=Bioconversion=Biotransformation Methods
- ▶ Bioreactors (Fermenters)
- ▶ Microbial Growth Kinetics
- ▶ Batch and Continuous Fermentation
- ▶ Stoichiometry of Microbial Growth and Product Formation
- ▶ Effect of Environmental Conditions on Microbial Growth Kinetics
- ▶ Methods of Microbial Growth Measurement
- ▶ Starter Culture Preparation
- ▶ Product Formation After Fermentation

# Learning Objectives

- ▶ **An ability to have a knowledge on the basic principles of biotechnology and food biotechnology.**
- ▶ **An ability to understand the methods and principles behind the genetic modification of organisms.**
- ▶ **An ability to have an understanding of the potential risks as well as benefits of food biotechnology.**
- ▶ **An ability to learn microbial biotechnology in depth, emphasizing applications to the food industry and methods of large-scale cultivation of microbes and other cells.**
- ▶ **An ability to have a knowledge on recent developments in food biotechnology.**

# Suggested References

- ▶ Johnson-Green, P. (2002). **Introduction to Food Biotechnology**. CRC Press, USA.
- ▶ Lee, B.H. (2015). **Fundamentals of Food Biotechnology** (Second edition). Wiley & Sons, Ltd., UK.
- ▶ Amarakoon, I.I., Hamilton, C.L., Mitchell, S.A., Tennant, P.F., Roye, M.E. (2017). **Biotechnology**. In: Pharmacognosy-Fundamentals, Applications and Strategies. Badal, S., Delgoda, R. (eds). Elsevier.
- ▶ Gutiérrez-López, G.F., Barbosa-Cánovas, G.V. (2003). **Food Science and Food Biotechnology**. CRC Press, USA.
- ▶ Waites M. J., Morgan, N. L., Rockey, J. S., Higton, G. (2001). **Industrial microbiology, An Introduction**. Blackwell Sci., Great Britain.
- ▶ Okafor, N. (2007). **Modern Industrial Microbiology and Biotechnology**. Science Publishers, Enfield, NH, USA.
- ▶ Aran, N. (2010). **Gıda Biyoteknolojisi**. Nobel Yayın Dağıtım, Ankara. (*in Turkish*).

# Definition of Biotechnology

# What is Biotechnology?

- ▶ The term «**biotechnology**» dates back to 1919, when it was first coined by the Hungarian engineer Karl Ereky.
- ▶ At that time, biotechnology encompassed the use of living organisms for the production of new products from raw materials of biological origin.
- ▶ Hence the name consisting of a combination of the Greek words: **bios**-life; **techno**-technical; and **logos**-study.



# What is Biotechnology?

- ▶ The definition of biotechnology has been redeveloped a number of times.
- ▶ The most widely accepted definition was given by the Organization for Economic Cooperation and Development (OECD) in 1981.
- ▶ The OECD defines biotechnology as «**the application of scientific and engineering principles to the processing of materials by biological agents.**»

# What is Biotechnology?

There are many definitions of biotechnology.

One of the broadest definition is the one given at the United Nations Conference on Biological Diversity (also called the *Earth Summit*) at the meeting held in Rio de Janeiro, Brazil in 1992.

- ▶ That conference defined biotechnology as **“any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.”**

Examples of living things being used to make or modify processes for specific use;

- ▶ the use of microorganisms to make the antibiotic, penicillin or the dairy product, yoghurt
- ▶ the use of microorganisms to produce amino acids or enzymes are also examples of biotechnology.

# What is Biotechnology?

- ▶ The 2003 OECD definition of biotechnology is the «application of scientific and engineering principles to the processing of materials by biological agents to provide goods and services; new biotechnology involves the use of cellular and molecular processes to solve problems or make products.»
- ▶ The Office of Technology Assessment in the United States describes modern biotechnology as incorporating «a specific focus on industrial usage of recombinant deoxyribonucleic acid (rDNA), cell fusion, and novel bioprocessing techniques; industrial use of living organisms.»

# The interdisciplinary nature of biotechnology

