

Practical Industrial Microbiology ════════════════════ *Lab.1*

Introduction to Industrial Microbiology

✚ The Industrial Microbiology deals with the production of microbial biomass or microbial products by a process called fermentation. Industrial microbiology includes the use of microorganisms to manufacture food or industrial products (pharmaceutical and medical compounds, solvents, organic acids, chemical feed stocks, amino acids, and enzymes) in large quantities of physiologically active substances. Numerous microorganisms are used within industrial microbiology; these include naturally occurring organisms, laboratory selected mutants, or even genetically modified organisms (GMOs). In addition to bacteria and yeasts, animal and plant cell cultures are now used to produce sophisticated products such as monoclonal antibodies, immunomodulating compounds, and complex plant metabolite.

✚ Industrial microbiology mainly depends on the phenomenon fermentation, is described as any process that involves the production of biomass/ bioproducts by the use of microbes. The fermentation process basically consists of three parameters:

A. **Microbes:** Numerous microorganisms are used within industrial microbiology; these include naturally occurring organisms, laboratory selected mutants, or even genetically modified organisms (GMOs).

Characteristics of microbes used in industrial microbiology:

- 1-The organisms must be capable of growth and product formation in large scale culture.
- 2-It should be easily inoculated into the large fermenters.
- 3-It must grow rapidly and produce the desired product in a short period of time.
- 4-Must grow in relatively inexpensive liquid culture medium obtainable in bulk quantities.

5-Industrial microorganisms should not be pathogenic, especially to human.

6-Should be amenable to genetic manipulation.

Examples of Microorganism in Industrial Microbiology:

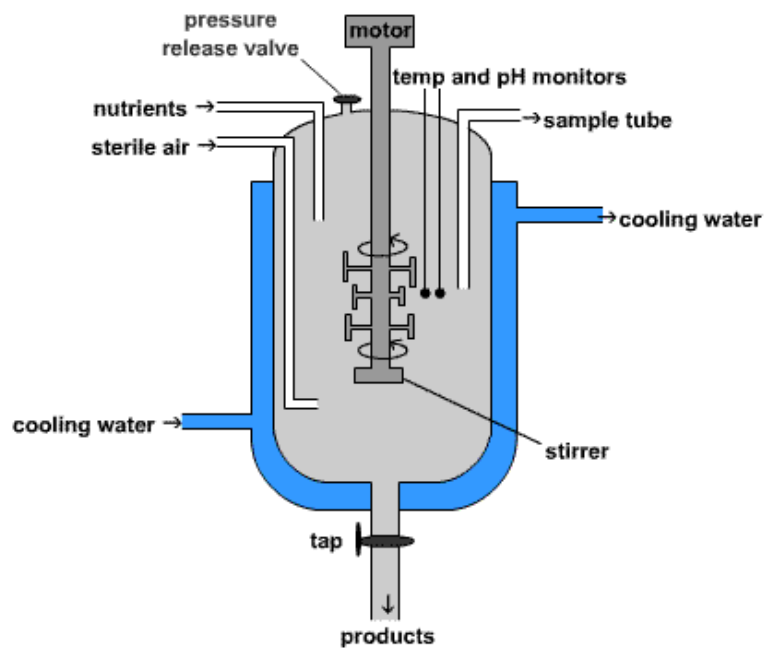
<u>Product:</u>	<u>Microorganism:</u>
1. Yogurt	<i>Lactobacillus bulgaricus</i>
2. Lipase	<i>Rhizopus sp.</i>
3. Sour cream	<i>Streptococcus diacetylactis</i>
4. Penicillin	<i>Pencillium notatum, P. chrysogenum</i>
5. vinegar	<i>Acetobacter or Gluconobacter</i>
6. Bacitracin	<i>Bacillus subtilis</i>
7. Citric acid	<i>Aspergillus niger</i>
8. Buttermilk	<i>Streptococcus diaacetylactis</i>
9. Insulin	<i>E. coli</i>
10. Vit B ₁₂	<i>Streptomyces olivaceus</i>

B. Fermentation media: The growth medium (liquid or solid) in which microbes grow and multiply, usually using specifically designed media under carefully controlled conditions, including temperature, pH, oxygen, and nutrient feeding during the course of the fermentation. The main components of media are: carbon (molasses, whey, and grains), nitrogen (ammonia and ammonium salts), phosphorous, trace minerals and other growth factors

C. Fermenter: is an instrument which is used for controlling and providing environmental condition to produce a special product. There are two types of fermenter:

1- **Batch culture:** is a closed system in broth medium in which no additional nutrient is added after inoculation of the broth.

2- ***Continuous culture***: is an open system in which fresh media is continuously added to the culture at a constant rate, and old broth is removed at the same rate. This method is accomplished in a device called a chemostat.



Continuous culture