**Lec. 8 Fermentation and Separation of Bio-products**

**Fermentation by microorganisms**

Bioprocess or fermentation technology is an important component in biotechnology process and involve complete living cells (microbe, mammalian or plant), organelles or enzymes as the biocatalyst and will aim to bring about specific chemical and/or physical changes in organic materials.

**Stages of fermentation**

**1-Screening and isolation of microorganisms**

**Screening** may be defined as the use of highly selective procedures to allow the detection and isolation of only those microorganisms of interest from among a large microbial population. The techniques that used for screening:

**1-Crowded plate technique:** The crowded plate technique is the simplest screening technique employed in detecting and isolating antibiotic producers.

**2-Auxanography technique:** This technique is largely employed for detecting microorganisms ability to produce growth factors (eg. Amino acid and Vitamins) extracellularly.

**3-Enrichment culture technique:** This technique used to isolate the desired microorganisms from a heterogeneous microbial population present in the sample. Either medium or incubation conditions are adjusted so as to favor the growth of the desired microorganism.

The wild strains isolated from the nature have low production efficiency, therefore; many ways were used for enhance the productivity such as:

**1- Ecological ways:**

Provision of the optimal growth conditions for microorganism such as temperature, pH, aeration, humidity, media.....etc.

**2-Genetic ways:**

Any alteration in the inherited nucleic acid sequence of the genotype of an organism by using:

**1-Genetic mutation**

**a- Spontaneous mutation**

**b-Induced mutation**

**3-Controlled favorable environment**

Bioreactors are the containment vehicles of any biotechnology- based production process.To achieve optimization of the fermentation process the following must be adhered:

**1-Biological environment:** Excluding entrance of contaminating organisms and using the desired organisms.

**2-Physical environment:** supplement the optimal temperature for production and agitation for aerobic organisms.

**3-Chemical environment:** including pH, dissolved oxygen and excluding the inhibitors.

**Fermentation products**

**1-Microbial biomass:** The production of SCP that used as food for human and animals, also the yeast was used in the bread industry.

**2-Microbial enzymes:** Animal, plant and microorganisms produce different enzymes and huge amounts of enzymes produced by fermentation process.

**3-Microbial metabolites:**

**a-Primary metabolites:**

A primary metabolite is a kind of metabolite that is directly involved in normal growth, development, and reproduction. It produces during lag and log phases that together called trophophase and including proteins, lipids, carbohydrates, nucleic acids and amino acids.

**b-Secondary metabolites:**

The metabolites that don't appear to have an obvious role in the metabolism of the producing organism, but usually has an important ecological function.They produce during stationary phase and including antibiotics, toxins and hormones.

**4- Bioconversion:**

Also known as biotransformation refers to the use of live organisms to convert a substance found in the medium to a chemically modified form that has high commercial level. An example is bioconversion of progesterone to 11-alpha-Hydroxy progesterone by *Rhizopus nigricans. Bioconversion differ from chemical conversion in highly specificity,*