

Alcoholic Fermentation

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Fermentation

- Definition

chemical conversion of
carbohydrates into alcohols or
acids

Alcoholic Fermentation

- **Definition**

is a process which microorganism convert carbohydrates into ethanol and carbondioxide.



History

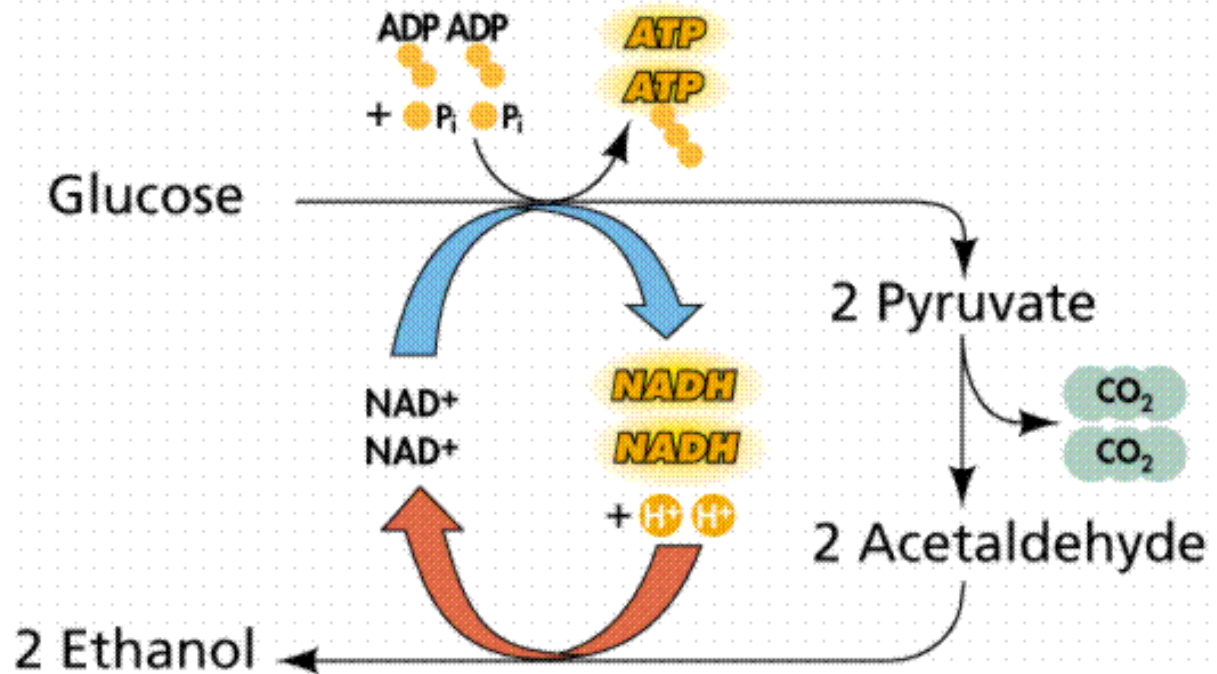


◆ **Louis Pasteur (1860)**

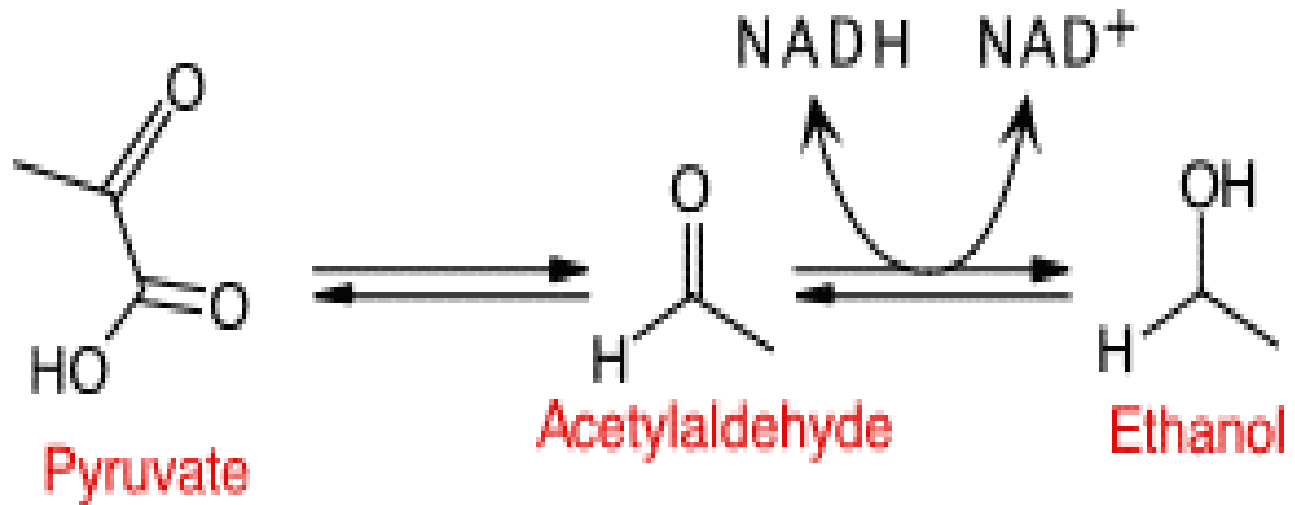
◆ **Hans Buchner & Eduard Buchner
(1897)**



Reaction of Alcoholic Fermentation



Reaction of Alcoholic Fermentation

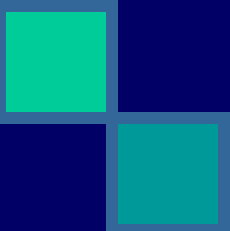



Bacteria

- are a large group of unicellular or multicellular organisms lacking chlorophyll
- simple nucleus, multiplying rapidly by simple fission
- They occur in air, water, soil, rotting organic material, animals and plants.



Bacteria

- 
- All bacteria require a source of nutrients for metabolism
 - The fermentative bacteria require carbohydrates
 - Fermenting bacteria have characteristic sugar fermentation patterns
- 

Example

- *Neisseria meningitidis* ferments glucose & maltose, but not sucrose & lactose
- *Neisseria gonorrhoea* ferments glucose, but not maltose, sucrose, and lactose

Yeast

- Eukaryotic micro-organism classified in Kingdom Fungi
- Yeast size typically measuring at 3–4 μm in diameter
- Yeasts are chemoorganotrophs

Fermentation by Yeast

- **Beer, Wine**
- **Root beer, Sweet carbonated beverages**
- **Industrial Ethanol Production**

Beer

- Brewer's yeast tolerate up to about 5% alcohol
- Beyond this alcohol level the yeast cannot continue fermentation



Parts of Home Brewing

- Parts 1
Aerobic (Oxygen is present)
This is the initial rapid process where the yeast is doubling its colony size every 4 hours.
(Usually 24-48 hours)
- Parts 2
Anaerobic (No oxygen present)
Slower activity and the yeast focuses on converting sugar to alcohol rather than increasing the number of yeast cells.

Industrial Ethanol Production

- Feedstock : Xylose in cellulosic biomasses
such as agriculture residues, paper wastes, and wood chips
- *Saccharomyces* yeasts



False Statement

- ✦ The culture must be growing on glucose because bacteria ferment a few other compounds
- ✦ The product of the fermentation must be more highly oxidized than substrate, otherwise no energy is conserved
- ✦ The culture can't be producing CO_2



Reference

- ✓ Fry M. 2011, Essential Biochemistry for Medicine Wiley
- ✓ Garrett R.H. et al. 2012 Biochemistry Brooks Cole Publishing Company
- ✓ Harvey R.A. et al. 2011 Biochemistry Wolters Kluwer Health/Lippincott Williams & Wilkins
- ✓ Laemmerhofer M. et al. 2013 Metabolomics in Practice: Successful Strategies to Generate and Analyze Metabolic Data Wiley
- ✓ Mathews C.K. et al. 2000 Biochemistry Benjamin Cummings
- ✓ Murray R.K. et al. 2012. Harper's Illustrated Biochemistry. 29th edition. McGraw Hill Medical.
- ✓ Nelson D.L and Cox M.S. 2008. Lehninger Principles of Biochemistry. 5th edition. W.H Freeman.