The Fermentation of Pyruvate

**Key Concepts:**

- **Review:** In the process of glycolysis, a net profit of two ATP was produced, two NAD\(^+\) were reduced to two NADH + H\(^+\), and glucose was split into two pyruvate molecules.
- When oxygen is not present, pyruvate will undergo a process called fermentation. In the process of fermentation the NADH + H\(^+\) from glycolysis will be recycled back to NAD\(^+\) so that glycolysis can continue.

In the process of glycolysis, NAD\(^+\) is reduced to form NADH + H\(^+\). If NAD\(^+\) is not present, glycolysis will not be able to continue. During aerobic respiration, the NADH formed in glycolysis will be oxidized to reform NAD\(^+\) for use in glycolysis again.

When oxygen is not present or if an organism is not able to undergo aerobic respiration, pyruvate will undergo a process called fermentation. Fermentation does not require oxygen and is therefore anaerobic. Fermentation will replenish NAD\(^+\) from the NADH + H\(^+\) produced in glycolysis.

One type of fermentation is **alcohol fermentation**. First, pyruvate is decarboxylated (CO\(_2\) leaves) to form acetaldehyde. Hydrogen atoms from NADH + H\(^+\) are then used to help convert acetaldehyde to ethanol. NAD\(^+\) results.

**Facultative anaerobes** are organisms that can undergo fermentation when deprived of oxygen. Yeast is one example of a facultative anaerobe that will undergo alcohol fermentation.

Some organisms, such as some bacteria, will undergo **lactate fermentation**. Two pyruvates are converted to two lactic acid molecules, which ionize to form lactate. In this process two NADH + H\(^+\) are converted to two NAD\(^+\).

Our muscle cells can undergo this process when they are in oxygen debt. If enough oxygen is not present to undergo aerobic respiration, pyruvate will undergo lactic acid fermentation.