



SECTION  
**4.6**

FERMENTATION  
**Reinforcement**

**KEY CONCEPT** Fermentation allows the production of a small amount of ATP without oxygen.

When oxygen is not available in cells, fermentation takes place instead. **Fermentation** is an anaerobic process that allows glycolysis to continue, but does not produce ATP on its own. The main function of fermentation is to remove electrons from molecules of NADH, the energy-carrier produced by glycolysis, to form NAD<sup>+</sup>. The molecules of NAD<sup>+</sup> are recycled to glycolysis, which can continue to produce a small amount of ATP without oxygen. There are two main types of fermentation.

- **Lactic acid fermentation:** Pyruvate and NADH from glycolysis enter the fermentation process. Energy from the NADH molecules is used to convert pyruvate into lactic acid. NADH molecules are converted into NAD<sup>+</sup> molecules that are recycled to glycolysis to pick up more electrons. This type of fermentation occurs in many types of cells, including human muscle cells.
- **Alcoholic fermentation:** Like lactic acid fermentation, pyruvate and NADH from glycolysis enter fermentation. Energy from NADH is used to break down pyruvate into an alcohol and carbon dioxide. NADH molecules are converted into NAD<sup>+</sup> molecules that are recycled to glycolysis. Alcoholic fermentation is used by many types of yeast.

Both types of fermentation are used in various commercial processes. Lactic acid fermentation is used to make yogurt. Alcoholic fermentation is used to make dough rise.

1. What is the function of fermentation?

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2. How are lactic acid fermentation and alcoholic fermentation similar? different?

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3. How is fermentation used in commercial processes?

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