

## What happens in the *fermentation* process?

The term „*fermentation*“ is of Latin origin and is closely related to "fermentum", the Latin name for leaven. Biotechnology refers to the fermentation process, when organic materials are transformed using bacteria, fungi, cultures, or by adding enzymes.

**Fermentation** is primarily the breakdown of carbohydrates, especially sugars, with the release of energy in the cell, which occurs when there is not enough oxygen in the environment. This anaerobic condition directs the process towards the formation of reduced products. In this way, lactic acid or ethanol is reduced from grape sugar, while the electrons required for the reduction are provided by NADH molecules (enzyme). Fermentation releases significantly less energy from sugar than biological oxidation. Fermentation is an incomplete combustion. About ten enzymes, magnesium salts, phosphates and coenzymes are required for fermentation. In industry, all processes in which various substances are produced with the help of microorganisms (fermentation industries), e.g. the vinegar, yeast, alcohol, beer production and some areas of the pharmaceutical industry. During fermentation, microorganisms (yeast and bacteria) convert carbohydrates (starch and sugar) into alcohol or acids. **Alcohol and acids act as natural preservatives** and give fermented foods and products a special intensity and sharpness. Fermentation also promotes the growth of beneficial bacteria known as probiotics. So the meaning of fermentation can be even healthy, gut-friendly foods and products.

Fermentation and decomposition are not the same thing. The two terms are often used interchangeably. But in fact, this is not entirely true, as fermentation is only one form of decomposition, while decomposition is only one step of fermentation. The concept of decomposition is mainly used when the emphasis is not on the by-products produced during the process (for example, in the case of the wastewater decomposition process). On the other hand, we speak of fermentation when the focus is on the by-products of the decomposition process, i.e. **the creation of the by-product is the specific purpose of the entire process** (for example, the creation of gases and acids, probiotics as a by-product in the process of food preservation or brewing).

## What happens in the *fermentation* process?

### **Six phases of fermentation**

The fermentation process can be divided into six phases. In order to achieve optimal results, the process must be stopped before the beginning of the stagnation phase (stationary phase).

- 1. Fermentation begins with the inoculation of the growth medium using the desired microorganism.*
- 2. During the (IP) or incubation period, microorganisms adapt to their new environment. Cell growth at this point is still slow.*
- 3. Then the (accelerated) growth phase begins, in which the growth rate increases continuously.*
- 4. In the decelerating growth phase, the growth rate decreases due to the decreasing nutrient concentration.*
- 5. This is followed by the stationary phase, where the biomass remains constant.*
- 6. The process ends with the death phase of the microorganisms (regression or death phase).*

Fermentation is a process where microorganisms, such as probiotics, break down nutrients and create new substances through enzymatic reactions. During fermentation, enzymes produced by microorganisms aid in the breakdown of nutrients, making them easier to absorb and utilize in the body. Probiotics generated during fermentation also contribute to the development of a healthy microbiome and may have anticancer effects due to their phenolic and polyphenolic antioxidants. Innovative fermentation supplements can enhance nutrient absorption and play a crucial role in maintaining health.

## What happens in the *fermentation* process?

***Fermentation in a controlled environment has many advantages over uncontrolled fermentation.***

***Some of these benefits include:***

Néhány ilyen előny a következőket tartalmazza:

***Consistency:*** In a controlled environment, carefully monitored conditions such as temperature, pH, and other factors can be adjusted as needed. This ensures that each batch of the fermented product is of consistent quality.

***Reduced contamination:*** Controlled environments help minimize the risk of contamination by unwanted microorganisms, which could negatively impact the fermentation process and final product quality.

***Increased efficiency:*** Optimizing fermentation conditions in a controlled environment can improve process efficiency, resulting in shorter fermentation times and higher yields.

***Enhanced safety:*** Maintaining health conditions and preventing harmful microorganisms from proliferating in a controlled environment can improve the safety and quality of the final product.

***Higher nutrient content:*** Precise control of fermentation conditions can enhance the nutritional content of the final product, resulting in more desirable and nourishing food or beverage.

Overall, a controlled fermentation environment facilitates consistent, high-quality, safe, and nutritious product production.

Because of these facts, ***TheSkill*** uses FermentForce SMSF technology.