



Microbial growth and reproduction

Nutrition is a process by which chemical substances called nutrients are acquired from the environment and used in cellular activities such as metabolism and growth. The majority of organic nutrients are molecules made up of the fundamental building blocks **hydrogen** and **carbon**. **Carbohydrates**, **lipids**, **proteins**, and **nucleic acids**, on the other hand, are examples of inorganic nutrients. Inorganic compounds include **metals** and their **salts**, such as **zinc**, **phosphorous**, **magnesium**, **calcium**, **potassium**, **sodium**, **sulfur**, **copper**, and **other gases** (oxygen, carbon dioxide), water, and vitamins.

Bacterial Division:

Bacteria and archaea reproduce asexually only, while eukaryotic microbes can engage in either sexual or asexual reproduction. Bacteria and archaea most commonly engage in a process known as binary fission, where a single cell splits into two equally sized cells. Other, less common processes can include **multiple fission**, **budding**, and the **production of spores**.

The growth of microorganism can be measured by:-

- 1- increase in size but this a poor criterion of growth.
- 2- increase in the number of microorganism by either counting the number of living cells (viable count) or all cells (total count).
- 3- measurement of some component of cell structures such as protein or DNA as an indication of microbial increase (growth) or decrease (death).

Generation time

Generation time is the time it takes for a population of bacteria to double in number. For many common bacteria, the generation time is quite short, 20-60 minutes under optimum conditions. For most common pathogens in the body, the generation time is probably closer to 5-10 hours.

Bacterial growth Curve: The curve shows the following phases:

1. Lag phase: During this phase, there is no increase in cell number; rather, bacteria are preparing for reproduction and synthesizing DNA and various inducible enzymes needed for cell division.

2. Log phase: This phase, also called the exponential phase, follows the lag phase and starts with a rapid increase in bacterial number

3. Stationary phase: The number of bacteria reaches a maximum in this phase and does not increase further (the growth rate is exactly equal to the death rate).

A bacterial population may reach stationary growth when a required nutrient is exhausted, when inhibitory end products accumulate, or when physical conditions are inappropriate for growth.

4. Death phase: Eventually, the number of viable bacterial cells begins to decline, signaling the onset of the death phase. No further divisions occur in this phase.

Death rate, in many cases, follows the same kinetics as the exponential growth.

