Definition

The bacterial growth curve represents the growth pattern of a population of bacteria over time.

Applications of Bacterial Growth Curve:

Microbiological research: Understanding microbial physiology and behavior.

Biotechnology: Optimization of microbial fermentation processes.

Food science: Assessing food spoilage and preservation methods.

Medicine: Studying bacterial infections and antibiotic efficacy.

Industrial applications: Monitoring and controlling microbial growth in various processes.

Measurement of Bacterial Growth

1. Direct Cell Count (This method involves directly counting the number of bacterial cells in a liquid culture. A Petroff-Hausser chamber or a specialized counting chamber, such as a hemocytometer, is used for microscopic observation and cell counting. This method provides an accurate cell count but can be time-consuming and labor-intensive.)

2. Plate Count (The plate count method is based on the ability of viable bacteria to form colonies on nutrient agar plates. The culture is serially diluted to obtain a countable range of colonies, which are then counted after incubation under suitable conditions. The results are expressed as colony-forming units (CFUs) per milliliter of the original culture. This method provides information about viable, culturable cells and is commonly used for estimating the total number of viable cells in a sample.)

Measurement of Bacterial Growth (cont)

3. Most Probable Number (MPN) (The MPN method is a statistical procedure used to estimate the number of bacterial cells in a sample, particularly when they cannot be detected using the plate count method. It involves inoculating multiple tubes or wells with different dilutions of the sample and observing growth or lack of growth after incubation. By referring to MPN tables or using software, the most probable number of cells can be determined based on the pattern of positive and negative growth.)

4. Indirect Cell Count (This method measures the cell density of a culture indirectly by assessing the turbidity or optical density of a liquid suspension. A spectrophotometer is commonly used to measure the absorbance of light passing through the sample. The more turbid or opaque the culture, the higher the absorbance or optical density, which correlates with a higher cell density. This method provides a quick and easy estimation of bacterial growth but does not distinguish between viable and non-viable cells.)

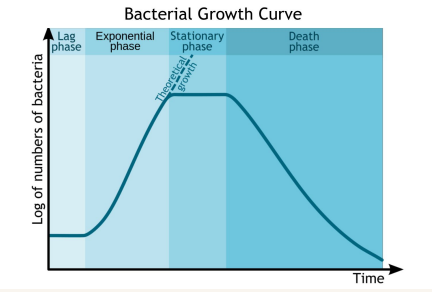
Phases of the Bacterial Growth Curve

a. Lag Phase:	Period of adjustment where bacteria adapt to the environment. Little to no increase in cell count occurs. Cells prepare for active growth.
b. Exponential (Log) Phase:	Rapid growth phase. Cells divide at their maximum rate. Population size increases exponentially. Ideal phase for harvesting cells or studying active metabolism.

Phases of the Bacterial Growth Curve (cont)

c. Stationary Phase:	Growth rate stabilizes. Number of dividing cells equals the number of dying cells. Nutrient depletion and waste product accumulation limit further growth. Cells enter a quiescent state.
d. Death Phase:	Decline in population size. Number of dying cells exceeds the number of dividing cells. Conditions become unfavorable for growth. Can be influenced by nutrient depletion, build-up of toxic byproducts, or other stressors.

Bacterial Growth Curve



Factors Influencing Bacterial Growth Curve

Nutrient availability: Presence of essential nutrients required for growth.

Temperature: Optimal temperature range for growth varies among bacterial species.

pH: Bacteria have specific pH requirements for growth.

Oxygen levels: Aerobic, anaerobic, or facultative growth conditions.

Environmental conditions: Light, pressure, salinity, etc.

Bacterial species: Each species has specific growth characteristics.

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Published 21st June, 2023.
Last updated 30th March, 2024.

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Experimental Techniques

Serial dilution: Diluting bacterial samples to obtain viable counts.

Plating techniques: Pour plate, spread plate, or streak plate methods for colony counting.

Optical density measurement: Using a spectrophotometer to measure cell density based on turbidity.

Molecular techniques: Quantitative PCR (qPCR) or real-time monitoring of specific genes or markers.

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Published 21st June, 2023.
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