

Bacterial Growth Curve

Bacterial Growth: Regular increase in cell mass and number it. Include replicate DNA , synthesis of new cell wall and plasma membrane and all cell components are double then cell division. This asexual process of reproduction is called **binary fission**.

Generation time: The time required for a population of cells to double in number.

A batch culture: or **Close culture** A closed bacterial culture system with specific nutrient, temperature, pressure, aeration and other Environmental conditions to optimize growth. Because nutrients are not added, nor waste products removed during incubation, batch cultures can only complete a limited number of life Cycles before nutrients are consumed and growth stops.

A batch culture **passes through 4 distinct stages or phases:**

1- Lag phase: Immediately after inoculation of the cells into fresh medium, during this period bacteria remains temporarily unchanged.

Although there is no apparent cell division occurring, the cell may be growing in volume or mass, synthesizing enzymes, proteins, RNA and increasing in metabolic activity.

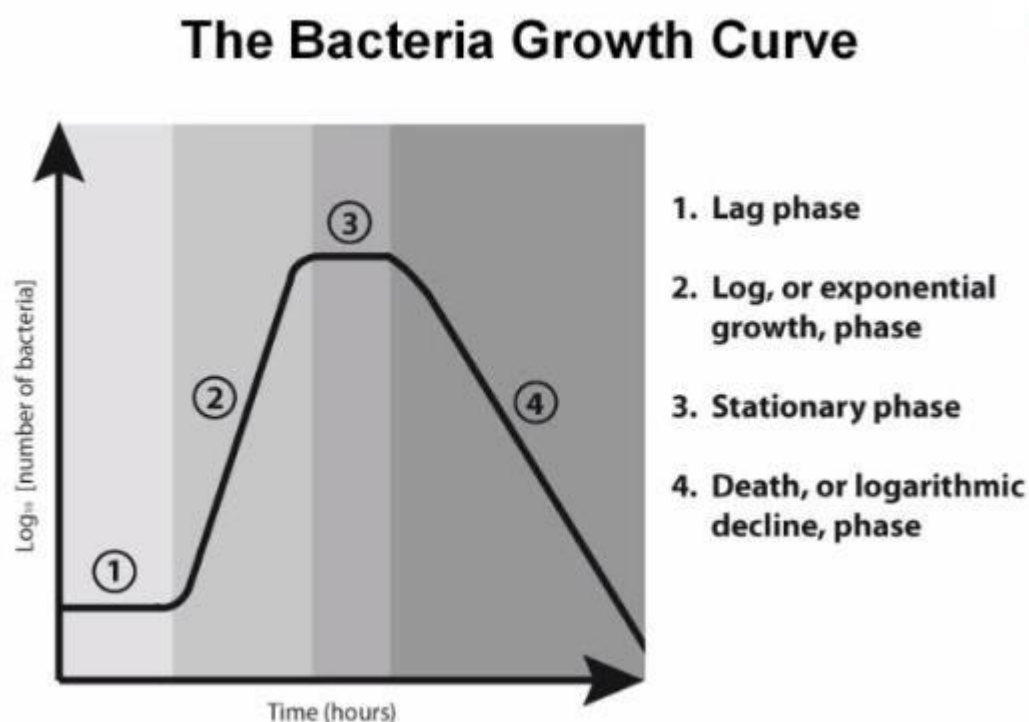
2-Log phase: or exponential phase: All cells are dividing regularly by binary fission. The cells divide at a constant rate depending upon the composition of the growth medium and the conditions of incubation.

Bacteria increase in mass and number during this phase and get logarithmic increase this meaning the number of new bacteria appearing per unit time. Log phase cannot continue indefinitely, however, because the medium is soon depleted of nutrients and enriched with wastes. **3-**

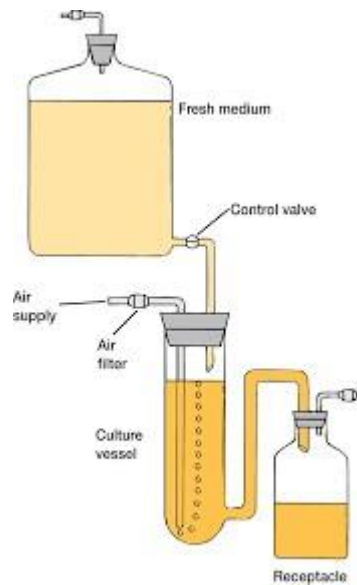
Stationary phase: is often due to a growth-limiting factor such as the depletion of an essential nutrient, or the formation of an inhibitory

product such as an organic acid. Stationary phase results from a situation in which growth rate and death rate are equal. The number of new cells created is limited by the growth factor and as a result the rate of cell growth matches the rate of cell death. The result is a horizontal linear part of the curve during the stationary phase. Mutation can occur during stationary phase.

4- Death phase bacteria die. This could be caused by lack of nutrients, environmental temperature above or below the tolerance band for the species, or other injurious conditions.



The continuous culture: is an open system in which fresh media is continuously added to the culture at a constant rate, and old broth is removed at the same rate.



The continuous culture

The essential feature of this technique is that microbial growth in a continuous culture take place under steady-state condition. Factors such pH value, concentration of nutrient and oxygen which change during the growth cycle of a batch culture , are all maintained constant in a continuous culture.