

Bacterial growth

The measurement of microbial concentration

Microbial concentration

can be measured in terms of cell concentration (the number of viable cells per unit volume of culture)

measured by means of

- photoelectric (standard curve) ,, viable counts
- turbidimetric measurement ,, viable and non viable
- visual estimate e.g. *E. coli* (10^7 /ml.)

Biomass concentration

Dry weigh of cells per unit volume of culture

It is cumbersome technique instead they refer to measuring an important cellular component

The growth curve

If a liquid media inoculated with microbial cells taken from, a culture that has previously been grown to saturation and the number of viable cells per milliliters determined periodically and plotted on a curve (six phases)

Lag phase (A)

Lag phase represent a period during which the cells depleted there metabolites and enzymes as a results of unfavorable conditions for there adaptation in this new environment

Exponential phase (C)

Cell divisions then proceeds at logarithmic rate determined by the nutrient content of the medium and conditions of culture* during this phase thee population can double approximately every 30 minute with fast growing bacteria, this is known as **doubling time or generation time**. (Time required population to double)

Generation time can be calculated; $g = t/n = t/3.3 (\log_{10} N - \log_{10} N_0)$

T= time

N= number of generation

Growth rate (number of generation /hours) =R

R (the reciprocal of the generation time g)

$R = 3.3 (\log_{10} N - \log_{10} N_0) / t$

Stationary phase

The exhaustion of nutrients or the accumulation of toxic products causes growth to cease completely, cell turn over takes place in the stationary phase , there is as slow loss if cells through death which is just balanced by the formation of new cells through growth and division so the total count increase and viable counts stay constant

Decline phase (F)

After a period in the stationary phase the bacteria starts to die although the total number of cells (viable and non-viable remains) constant

Maintenance of cells in the exponential phase

Cells can maintained at this phase by transferring them repeatedly into fresh medium of identical compositions while they are growing at this phase. By using two device chemostat or turbidostat.

Bacteria like all cells require nutrient for the maintenance of their metabolism and for cell division

Chemically bacteria consist of

- Proteins
- Polysaccharides
- Lipid
- Nucleic acid
- Peptidoglycan