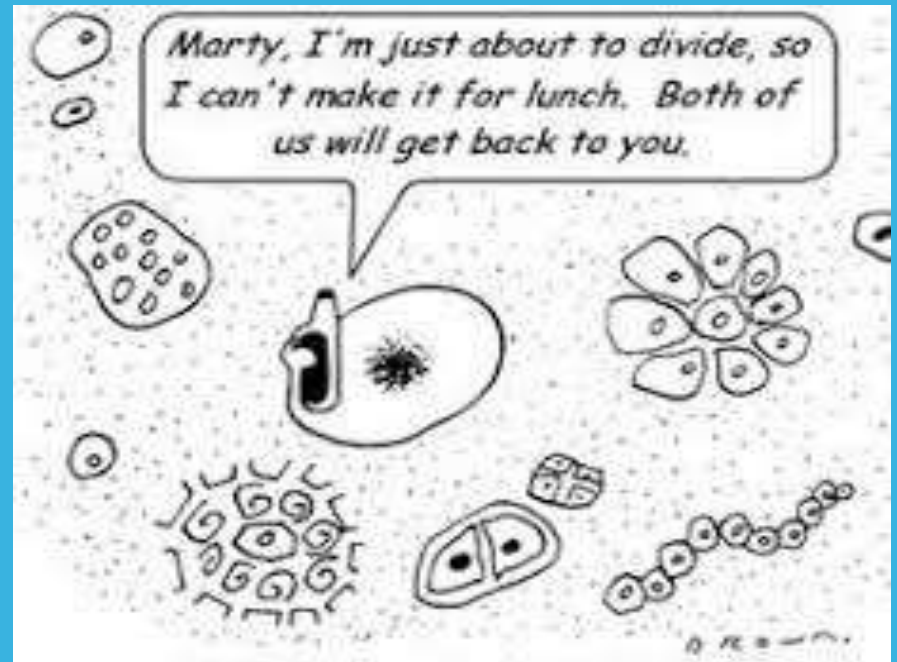


MICROBIAL GROWTH AND GROWTH CURVE

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INTRODUCTION

GROWTH : The term commonly applied to bacteria and other microorganisms usually refers to **changes in the total population** rather than an increase in size or mass of an individual organism.

When microorganisms are inoculated in to **suitable medium** and **incubated under appropriate conditions**, a tremendous **increase in the number of cells** occurs with in a relatively **short time**.

Example:

- Some species maximum population reached within **24 hours** (like **bacteria**)
- The other requires much longer **period of incubation** to reach maximum growth

MICROBIAL REPRODUCTION

Modes of cell division:

The modes of cell division in the usual growth cycle of microorganisms are as follows

- Binary fission
- Budding
- Fragmentation
- Formation of conidiospores or sporangiospores
- Septum formation

NEW CELL FORMATION (MACROMOLECULAR SYNTHESIS):

Microbial cells takes up **nutrients** from its environment / **medium**



And many **biochemical synthesis** takes place.



Nutrients are converted into **cell substance** like **RNA, DNA, Protein, enzymes and other macromolecules**.



cell **mass** and **cell size** increase.



And new **cell wall building blocks** are synthesized.



Subsequently the process of **reproduction is initiated**.



Which ultimately resulting in the formation of **new cells**.

GROWTH GENERATION TIME

Generation time is the time required for cell to divide/for population to double

Average for bacteria is 1-3 hours

E. coli generation time = 20 min

- 20 generations (7 hours), 1 cell becomes 1 million cells!

Bacterial population increase by geometric progression as follows

$1 \rightarrow 2 \rightarrow 2^2 \rightarrow 2^3 \rightarrow 2^4 \rightarrow 2^5 \dots\dots\dots 2^n$

Where N = Total number of generations

The total population N at the end of the given time period would be expressed

$$N = 1 \times 2^n$$

GROWTH CURVE PHASES

Growth cycle

- ❖ The Lag Phase – No growth
- ❖ The Logarithmic or Exponential Phase – Rapid growth
- ❖ The Stationary Phase – Leveling off
- ❖ The phase of Decline or Death – Decline in a viable population

Quantitative measurements of bacterial growth

- ❖ Direct Microscopic Count
- ❖ Electronic Enumeration of Cell Numbers
- ❖ The Phase count method
- ❖ Membrane – Filter Count
- ❖ Turbidometric Methods

STANDARD GROWTH CURVE

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