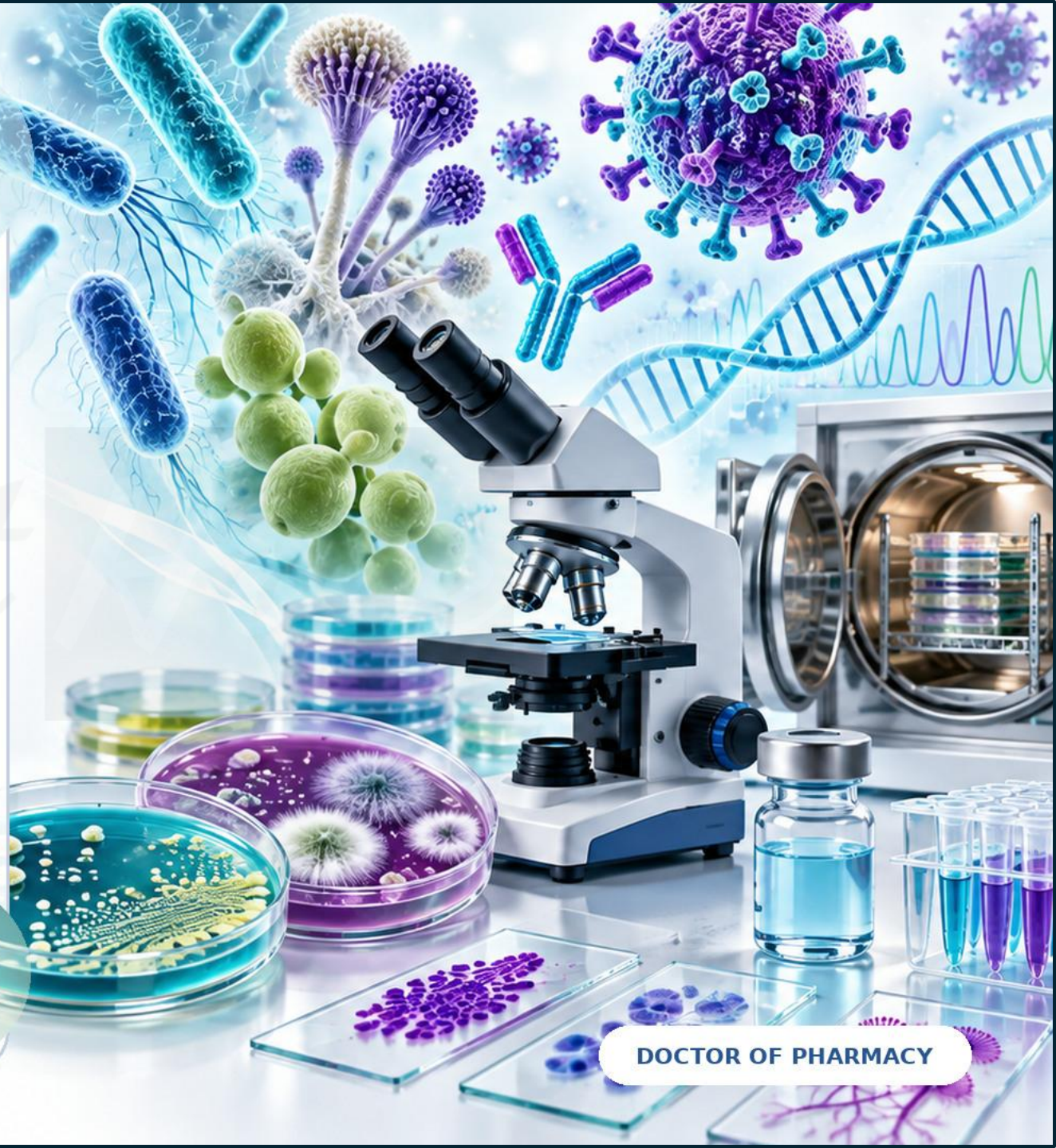
PHARM.D • YEAR 2

Pharmaceutical Microbiology

CHAPTER 3

Nutritional Requirements, Growth and Cultivation of Bacteria and Viruses

PPT CHAPTER COVER

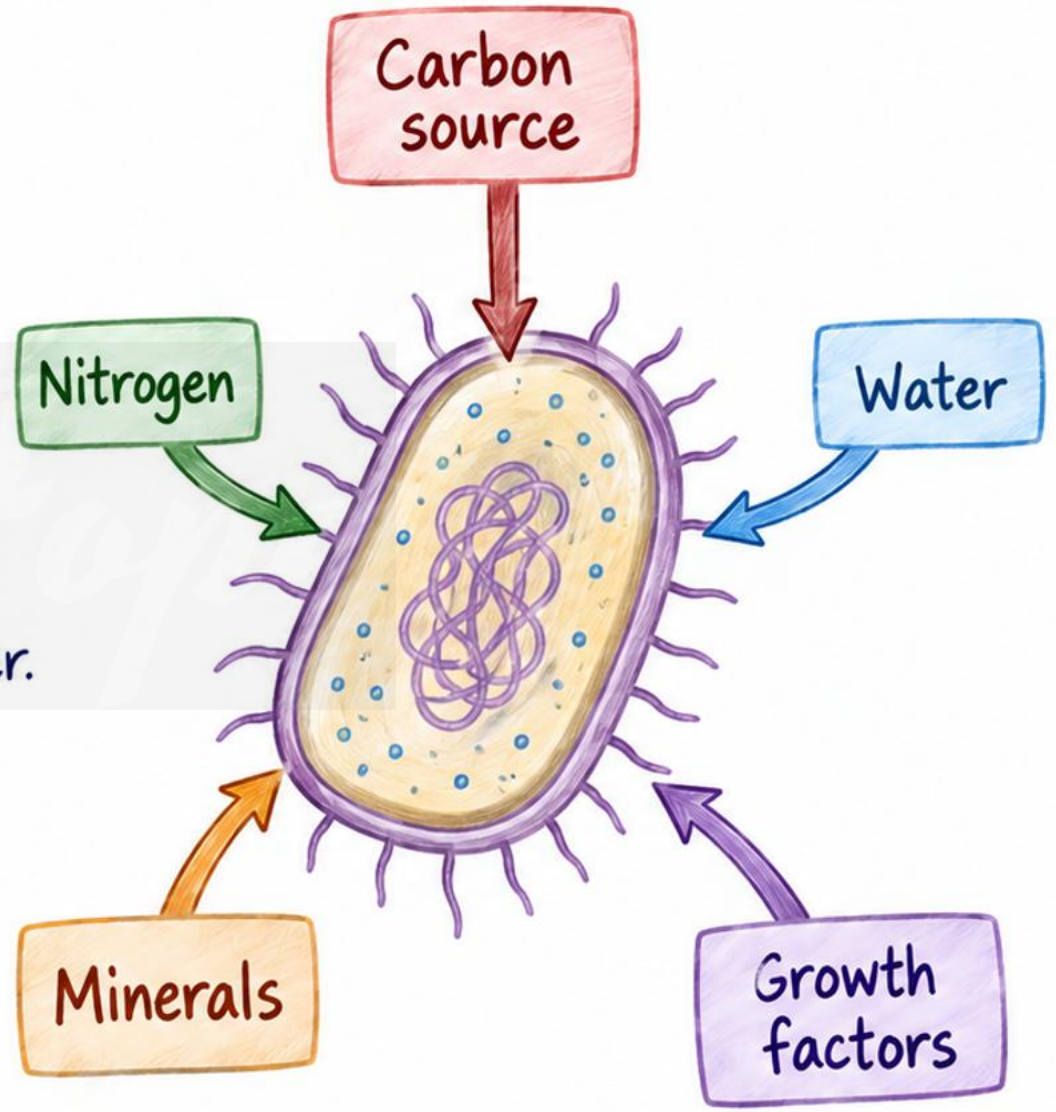


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What Bacteria Need to Grow

Bacteria require a carbon source, nitrogen, water and essential minerals. Phosphorus supports nucleic acids and membranes; sulfur enters certain amino acids. Trace elements serve as enzyme cofactors. Some species need preformed vitamins, amino acids, purines or pyrimidines. Nutrient requirements vary, so a medium that grows one organism may fail for another.

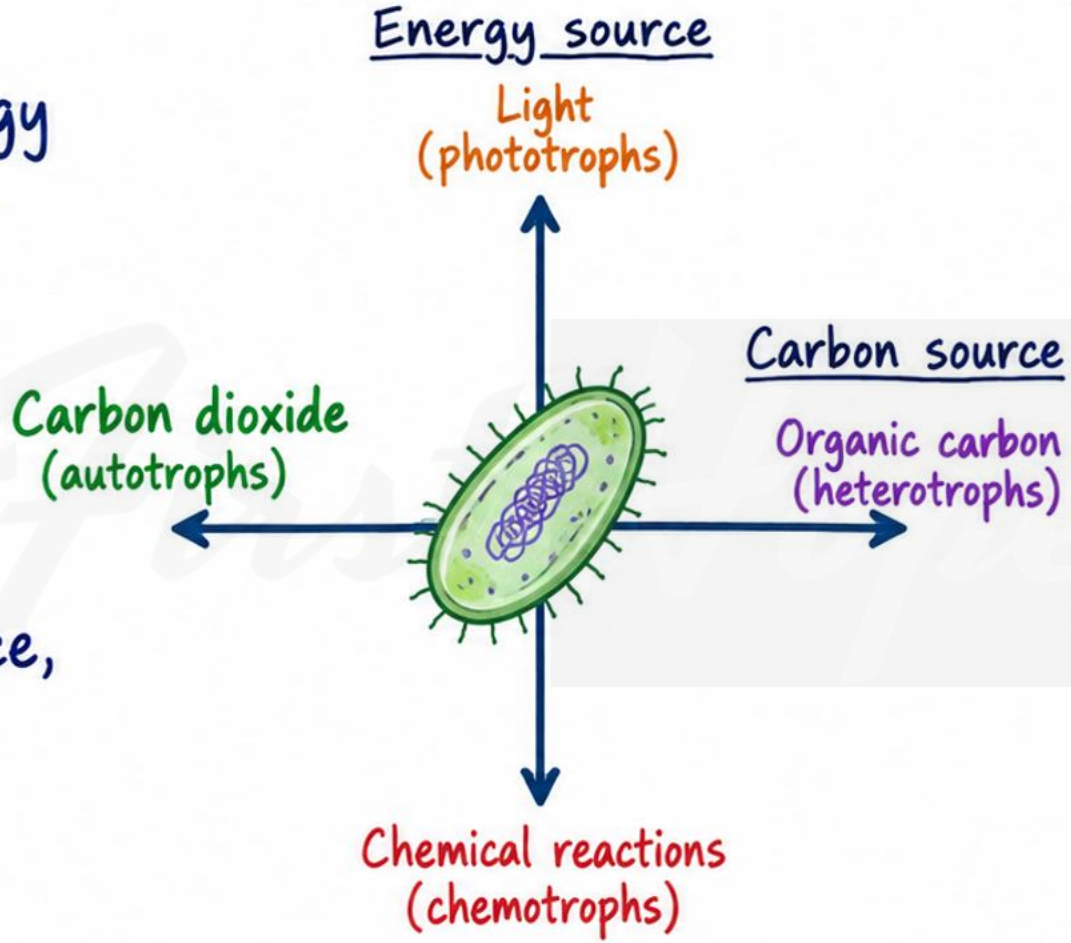
A growth medium supplies available nutrients at usable concentrations. Transport media are different: they protect organisms during delivery rather than maximize multiplication.



Energy and Nutritional Types

Phototrophs obtain energy from light; chemotrophs obtain it from chemical reactions.

Autotrophs use carbon dioxide as a carbon source, while heterotrophs use organic carbon.



These energy and carbon categories combine in different ways. Clinical pathogens are commonly chemoheterotrophs, but metabolic diversity is much broader.

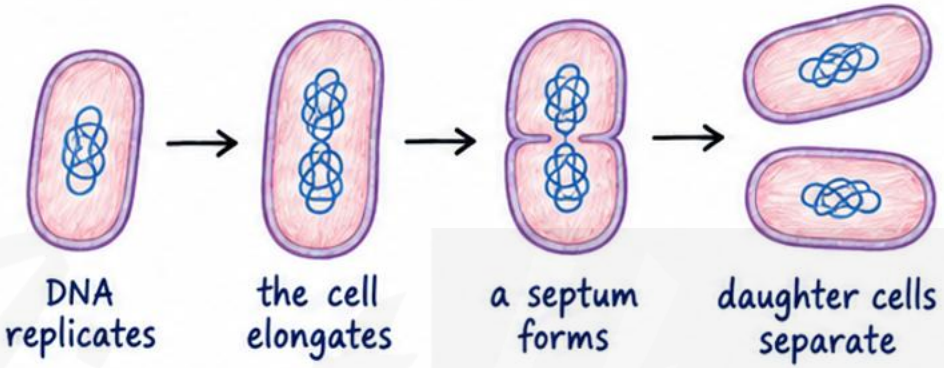
A cell's energy source and carbon source answer separate questions. Classifying both prevents the false assumption that all light users fix carbon dioxide.

Binary Fission and Growth Curve

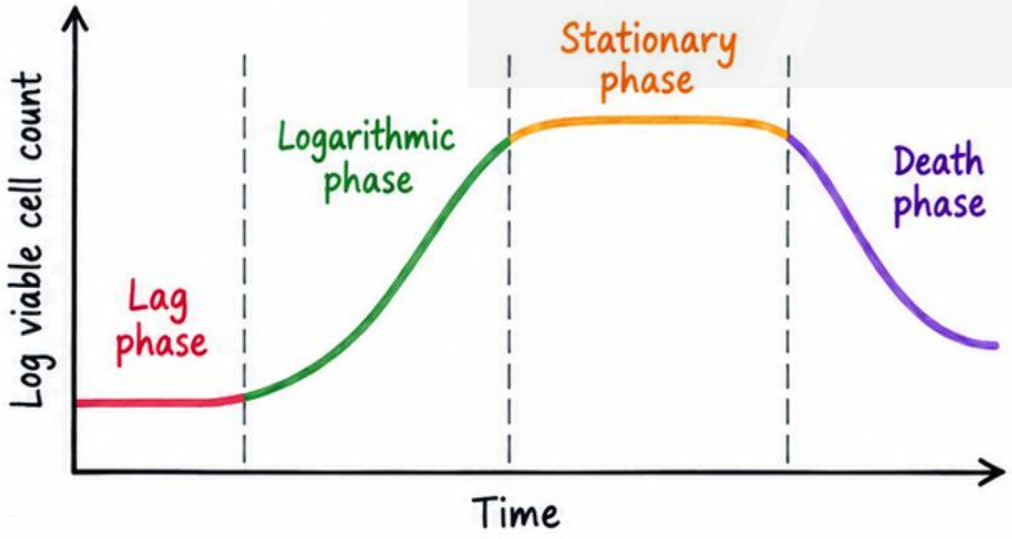
Bacteria usually reproduce by binary fission: DNA replicates, the cell elongates, a septum forms and daughter cells separate.

In closed batch culture, growth passes through lag, logarithmic, stationary and death phases. Log phase reflects rapid division; stationary phase reflects limited nutrients and accumulated waste. The curve is a population pattern, not a cell-life cycle.

Binary fission in bacteria



Bacterial growth curve (closed batch culture)



During lag phase cells adapt before rapid multiplication.

In stationary phase, cell division may continue but is approximately balanced by cell death.

Generation Time and Culture Conditions

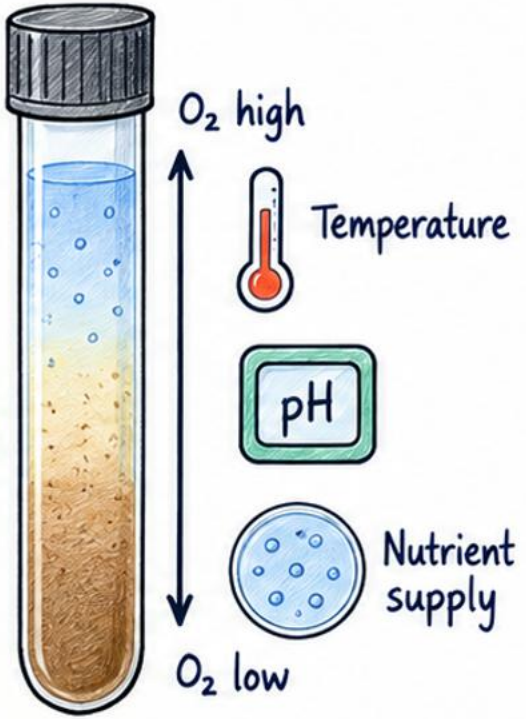
Generation time is the interval for a population to double under defined conditions.

It changes with nutrient supply, temperature, pH, oxygen and osmotic pressure.

Aerobes need oxygen; obligate anaerobes are harmed by it; facultative anaerobes can grow with or without oxygen.

Growth conditions must match the organism and specimen.





Generation time is measured in a defined environment; it is not a permanent species constant.

Handle obligate anaerobes rapidly to minimize oxygen exposure.

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