



Microbial Nutrition And bacterial Classification Microbiology Unit-I

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Objectives

At the end of this lecture the students will be able to:

1. Define key terms.
2. Identify the basic nutrition of bacteria. •
3. Classify bacteria on the basis of nutrition and morphology.



Microbial Nutrition

Nutrients: are substances that are used to supply energy.

- Nutrients are substances used in biosynthesis and energy production and requires for growth. Nutrients are basically classified into two types. **Macro and Micro Nutrients.**

• **Macronutrients:** These are Required by microorganisms in large amounts and constitute 95% of cell dry weight.

-**Basic Microbial Nutrients:** -H₂O, C, O, H, N, S, P



Water

Water is essential for cellular activities. It constitutes 70- 90% of the weight of a cell. Water is a universal solvent and it dissolves many chemical substances including nutrients to make them readily available for the absorption by microorganisms.

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- Carbon Microorganisms use carbon as an essential nutrient. It constitutes about 50% of the dry weight of a bacterial cell. Two major sources of carbon are organic and inorganic compounds. Carbon dioxide is inorganic source of carbon.

• Oxygen:



Oxygen is very important for life but, however, there are some exceptions for some bacteria. The bacteria which can live only in the presence of molecular oxygen are called strict **aerobes** (e.g, Mycobacterium tuberculosis) and those which can grow only in the absence of oxygen are called **strict anaerobes** (e.g, Clostridium tetani) Some of the bacteria that can live in both conditions are called **facultative anaerobes**.

Nitrogen



Nitrogen is a major constituent of protein, nucleic acid, and other molecules of microorganisms. It is, therefore, very important. A typical bacterial cell is composed of 12% of nitrogen by its dry weight. Microorganisms obtain nitrogen from organic and inorganic sources. Organic sources include amino acids and other organic nitrogen containing compound. Inorganic sources include atmospheric nitrogen, nitrate and ammonia etc.

- Sulfur

Sulfur is an essential constituent of proteins. It is primarily found in sulfur-containing amino acids like cysteine and methionine. Some bacteria use H_2S and sulfides as a source of sulfur.

Phosphorous Phosphorous is an important component of bacterial cell. It is a constituent of nucleic acid, phospholipids, nucleotides, and ATP etc. The common sources of phosphorous for bacteria are phosphate salts.



Micronutrients

Micronutrients or trace elements are required in trace amounts by most cells. The common micronutrients are Na, Mg, Cl, K, Ca, Mn, Fe, Zn, Co, etc. They are part of enzymes and cofactors. All these micronutrients are obtained by microorganisms from their environment. Some of the bacteria cannot live in the absence of specific micronutrients which are called **fastidious organisms**.



Nutritional types of Microorganisms ►

Carbon Source: Microorganisms are classified into two groups on the basis of sources of carbon as **autotrophs** and **heterotrophs**.

Autotrophs are the microorganisms which derive carbon from inorganic compounds like CO₂.

Heterotrophs are the microorganisms which derive carbon from different organic compounds like sugar, alcohol etc.

► **Energy Source:** Microorganisms depend upon different sources of energy. The organisms which depend on sunlight as a major source of energy are called **phototrophs**. Other organisms which use chemicals as a source of energy are called **chemotrophs**. Autotrophs may either use sunlight or chemical compounds as energy source; they are called photoautotrophs and **chemoautotrophs** respectively.





Likewise, **heterotrophs** may either use sunlight or chemical compounds as energy source; they are called **photoheterotrophs** and **chemoheterotrophs** respectively.

THE END



THANK YOU
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