

Nutrition in Bacteria

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From nutritional point of view, bacteria are the most versatile organisms. They may be autotrophic, heterotrophic, and symbiotic.

I - AUTOTROPHIC BACTERIA:

These bacteria oxidise simple inorganic or organic substances and synthesise their own food.

They are of two types

1. Photoautotrophic (Photosynthetic), and
2. Chemoautotrophic (Chemosynthetic)

1. Photoautotrophic bacteria; (i) These bacteria can convert radiant energy into the chemical energy, and CO_2 is reduced to carbohydrate. The only difference from the photosynthesis of higher plants is that they require hydrogen donors other than water. Hence oxygen is never produced.

(ii) On the basis of hydrogen donor, photosynthetic bacteria are further divided into two types -

(a) photolithotrophs

(b) photo-organolithotrophs

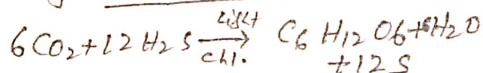
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The H-donor is an inorganic substance

Green Sulphur Bacteria

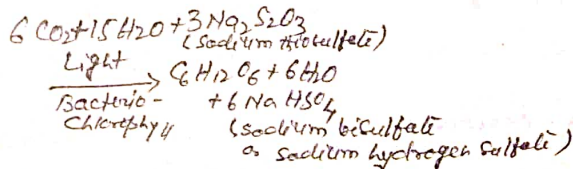
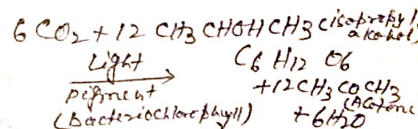
Purple Sulphur bacteria

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 H-donor is Hydrogen Sulphide (H_2S) and the pigment is chlorobium chlorophyll (bacteriochlorophyll)
 eg, Chlorobium

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 Use Sulphur compounds, pigment - Bacteriochlorophyll
 eg, Chromatium



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 The H-donor is non-sulphur organic compounds like organic acids, alcohol, etc.
 eg, Purple non-sulphur bacteria (Rhodospirillum)

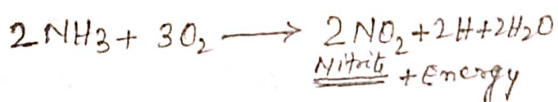


2. Chemoautotrophic bacteria: These bacteria do not

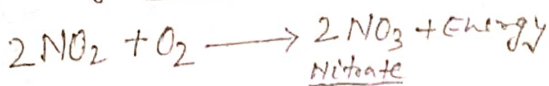
require light and pigment for their nutrition. The energy comes from the oxidation of inorganic and organic substances. In nature most of the bacteria are chemoautotrophs. Two types - on basis of source of energy -

(a) Chemolithotrophs
utilise energy released in the oxidation of inorganic substances. It may be of following types

(i) Nitrifying bacteria -
oxidise ammonia into nitrite and then nitrite into nitrate.



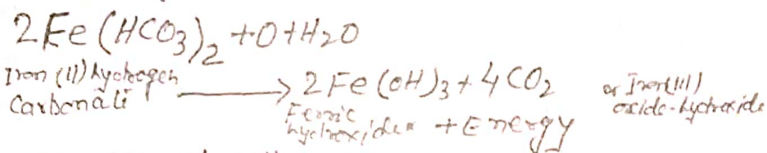
e.g., Nitrosomonas



e.g., Nitrobacter

(ii) Iron bacteria -

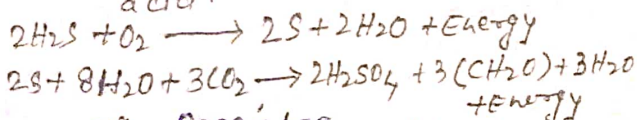
Ferrous compounds are converted into ferric compounds and energy is released.



e.g., Ferrobacillus, Leptothrix

(iii) Sulphur bacteria -

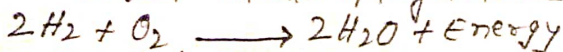
H₂S is changed into ~~H₂S~~ free sulphur and then into sulphuric acid.



e.g., Beggiatoa, Thiobacillus

(iv) Hydrogen bacteria -

convert molecular hydrogen into water.

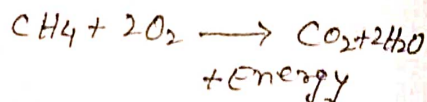


e.g., Hydrogenomonas

(b) Chemo-organotrophs

These bacteria oxidise organic substances for energy.

e.g., Methane bacteria such as Methanococcus oxidises methane into CO₂ and H₂O.



Acetobacter and Lactobacillus are other common chemo-organotrophs.

Iron(II) refers for ferrous
Iron(III) refers for ferric

Iron (III) refers to element iron in its +3 oxidation state. In ionic it is denoted as Fe³⁺ or referred as ferric.

II - HETEROTROPHIC BACTERIA:

These bacteria don't synthesize their own food and are dependent on other organisms for the nourishment. They may be Parasites or Saprophytes.

1. Parasitic bacteria: These bacteria derive their nutrition from the plants and animals on which they grow. As a result of their growth, certain enzymes are produced which decompose or kill the protoplasm of the host cell. Such effects of the parasites are visible on the host in the form of disease development. These are also known as Pathogenic bacteria.

e.g., Streptococcus, Clostridium.

2. Saprophytic bacteria: The bacteria grow on dead plants and animals, dung, rotten wood, stagnant water and many other decaying substances rich in organic matter. Certain enzymes secreted by the bacteria decompose the complex organic substances of the substrate, converting them into simpler ammonium compounds. Putrefying bacteria like Bacillus mycoides, B. pasteurii etc. belong to this category.

Most of the saprophytic bacteria are harmless to humans, but some can be harmful through the toxin they secrete. The souring of milk, manufacture of cheese, preparation of butter from milk and vinegar from sugarcane juice, are various processes completed by the action of specific saprophytic bacteria.

III - SYMBIOTIC BACTERIA: Some bacteria are found in close association with other organisms and both of them are mutually benefitted. A few species of Rhizobium (e.g., R. leguminosarum) are found in the root nodules of leguminous plants and helps in fixing the atmospheric nitrogen for the plants. The plants provide protection and nutrition in the form of carbohydrates to the bacterium. Such bacteria add to the fertility of soil.

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