

Table 4-10 Characteristics of Photoautotrophic Microorganisms

Group and Examples	Description	Bacteriochlorophylls (Bchl) or Chlorophylls (Chl) and Carotenoids	Photosynthetic Membranes
PURPLE SULFUR BACTERIA (CHROMATIACEAE) <i>Chromatium,</i> <i>Ectothiorhodospira</i>	Gram-negative anoxygenic bacteria that grow only in the absence of air; depend on sulfide as an electron donor for generating reduced coenzymes; purple-red to red-brown in color	Bchl <i>a</i> or Bchl <i>b</i> , Lycopanol, Spirilloxanthin, Okenone	Vesicles, tubules, or lamellae that are continuous with the cytoplasmic membrane
PURPLE NONSULFUR BACTERIA (RHODOSPIRILLACEAE) <i>Rhodospirillum,</i> <i>Rhodopseudomonas,</i> <i>Rhodobacter</i>	Gram-negative anoxygenic bacteria; can utilize sulfide only at very low concentrations; otherwise use organic acids as electron donors; purple-red in color	Bchl <i>a</i> or Bchl <i>b</i> , Spheroidene, Spirilloxanthin, Lycopanol	Vesicles, tubules, or lamellae that are continuous with the cytoplasmic membrane
GREEN SULFUR BACTERIA (CHLOROBIAACEAE) <i>Chlorobium</i> <i>Pelodictyon</i>	Gram-negative anoxygenic bacteria that grow only in the absence of air; depend on sulfide or thiosulfide as an electron donor to generate reduced coenzymes; fix carbon dioxide but grow better on simple organic acids, such as acetate; they typically form the lowest layer of photoautotrophs growing in a stratified lake; green to brown in color	Bchl <i>c</i> , Bchl <i>d</i> , or Bchl <i>e</i> ; some Bchl <i>a</i> , Chlorobactene	Photosynthetic apparatus in cytoplasmic membrane; light harvesting pigments in chlorosomes
GREEN NONSULFUR BACTERIA (CHLOROFLEXACEAE) <i>Chloroflexus</i> <i>Chloronema</i>	Gram-negative anoxygenic bacteria that flex and glide and usually occur as a golden mat under a layer of cyanobacteria; typically found in hot springs; capable of photoheterotrophic growth using light energy to generate ATP and organic compounds to generate reduced coenzymes and cellular macromolecules; green to golden in color	Bchl <i>a</i> and Bchl <i>c</i> or Bchl <i>d</i> , β -Carotene, γ -Carotene	Photosynthetic apparatus in cytoplasmic membrane only
GRAM⁺: <i>Heliobacteria,</i> <i>Heliobacterium,</i> <i>Heliobacillus</i>	Gram-positive anoxygenic bacteria that are relatively tolerant of air; green-golden in color; photoheterotrophic	Bchl <i>g</i> Neurosporene	Photosynthetic apparatus in cytoplasmic membrane only
CYANOBACTERIA <i>Anabaena, Nostoc</i>	Oxygenic photosynthetic bacteria	Chl <i>a</i> phycobiliproteins	Thylakoid membranes
PROCHLOROBACTERIA <i>Prochloron</i>	Oxygenic photosynthetic bacteria	Chl <i>a</i> and Chl <i>b</i> phycobiliproteins, β -carotene	Thylakoid membranes
ALGAE	Oxygenic photosynthetic eukaryotes; green, golden, red, or brown	Chl <i>a</i> , Chl <i>b</i> , Chl <i>c</i> or Chl <i>d</i> β -Carotene, Phycoerythrin Phycocyanin, Xanthophylls, Fucoxanthin	Thylakoid membranes of chloroplasts