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We propose that the photosynthetic procaryotes containing chlorophylls *a* and *b* in the species *Prochloron didemni* sp. nov., genus *Prochloron* gen. nov., be placed under the International Code of Nomenclature of Bacteria by including the genus *Prochloron* in the family *Prochloraceae* fam. nov., order *Prochlorales* ord. nov. in the class *Photobacteria* Gibbons and Murray 1978, listed on the approved lists of bacterial names.

The discovery by Lewin (12, 13) of the procaryotic photosynthetic microorganisms that have two forms of chlorophyll *(a and b)* and lack phycobilins led him to create a new division of algae termed *Prochlorophyta*, based on the genus *Prochloron*. This interpretation of the taxonomic position of these organisms does not appear reasonable, because they have a procaryotic structure which constitutes the definitive property of bacteria. The discovery of these new procaryotes has stimulated speculation about their phylogeny *(1, 2, 4, 5, 10, 16, 30)*, the possible endosymbiotic origins of the plastids of eucaryotic cells *(14, 18)*, and the evolution of procaryotic photosynthesis. The most significant questions concerning the evolution of these microorganisms can be summarized as follows. First, since the *Didemnidae* (colonial ascidians) are relatively young in evolutionary terms, the symbiotic procaryotes of the genus *Prochloron* must presumably either have existed previously as free-living organisms or have evolved since the *Didemnidae* evolved. The first possibility is suggested by the demonstration that *Prochloron* sp. can be grown, although for only a few generations, in a laboratory culture in medium MN of Rippka et al. *(23)* supplemented with tryptophan *(20)*. Second, hypotheses about these procaryotes postulate evolution from a typical cyanobacterium in which the ability to synthesize chlorophyll *b* was acquired either by molecular evolution or by transfer of the genetic information from some green alga. As a consequence of the possession of chlorophyll *b*, further evolutionary steps, such as the loss of phycobilins and the modified thylakoid arrangement, might have occurred rapidly. If there is a strong selective advantage for these procaryotes to possess chlorophyll *b* rather than phycobilin pigments, then it would seem that further examples of chlorophyll *b*-containing procaryotes may be found in shallow marine waters *(30)*. Another possibility is that the cyanobacteria and members of the genus *Prochloron* evolved from a common photosynthetic ancestor which contained chlorophyll *a* but not phycobiliproteins *(7)*. The phycobiliproteins would have developed as accessory pigments for photosystem II in the cyanobacterial lineage, while a (possibly more ancient) chlorophyll *a-b* protein complex served this function in *Prochloron* *(28)*. In any case, it is quite evident that the surviving lineages of oxygenc procaryotes, cyanobacteria and *Prochloron*, are more closely related to each other than they are to other groups of photosynthetic organisms *(9, 30)*. Since the relationships among these two groups are not firmly established, it is not advisable to suggest the inclusion of the phylum *Prochlorophyta* in the cyanobacterial lineage. The only indication about the existence of a close relationship between *Prochloron* and the cyanobacteria comes from the studies of Seewaldt and Stackebrandt *(25)* and Stackebrandt et al. *(26)* on the 16S rRNA sequence homology. However, Van Valen *(28)* has challenged their conclusion by showing that their data allow the construction of an alternative phylogeny in which *Prochloron* falls outside the cyanobacteria. Therefore, the best provisional solution seems to be their separation from the cyanobacteria by the creation of an order in the class *Photobacteria* Gibbons and Murray 1978.

Lewin’s statement, "*Prochloron* is clearly a unique procaryote in that it makes chlorophylls *a* and *b*" *(15)*, is consistent with present knowledge of the ultrastructure, biochemistry, and molecular biology of this group *(2, 17, 25, 28, 31)*. Stanier and van Niel *(27)* concluded that "*A definition of a bacterium is only possible if one includes the blue-green algae*." As pointed out by Rippka and Cohen-Bazire *(22)*, "They undoubtedly would have extended their argument to include *Prochloron*, if this organism had not evaded discovery for so long". The procaryotic nature of *Prochloron* implies that its systematic position must be found within the procaryotic domain and in accordance with the International Code of Nomenclature of Bacteria *(8)*. Consequently, we propose that the genus *Prochloron* Lewin (with *Prochloron didemni* as type species), the family *Prochloraceae*, and the order *Prochlorales* in the class *Photobacteria* Gibbons and Murray 1978, should be taken into consideration by the Subcommittee on Phototrophic Bacteria for inclusion in the Validation List.

**Description of the order *Prochlorales* ord. nov., nom. rev. **

*Prochlorales* (Pro.chlo.ral'es. M.L. fem. n. *Prochloraceae* type family of order; *ales* ending to denote an order; *M.L.*
fem. pl. n. Prochlorales the Prochloraceae order) cells are unicellular or multicellular gram-negative photosynthetic procaryotes, containing chlorophylls a and b and carotenoids. Motile or nonmotile. Free living or symbionts on invertebrate animals (didemnid ascidians, sponges, or tectibranch molluscs). Aerobic or facultatively anaerobic. Perform oxygenic photosynthesis. Photoautotrophic or myxotrophic.

The photopigments are located on paired (not single) thylakoids without phycobilisomes. The arrangement of DNA, scattered in the periphery of the cell (therefore the center appears hollow), is different from that of all the cyanobacteria (6). The cells do not contain gas vacuoles or carotenophin. This broad definition of the ordinal rank is made not to restrict Prochlorales solely to the photosynthetic procaryotes having a proven symbiotic capacity in a given host, but to make possible the inclusion of free-living members, which can be cultivated away from the host. Presently it is suggested that Prochlorales includes one family with the following diagnosis.

Prochloraceae fam. nov. Members of the family Prochloraceae (Prochlo'rae'ceae) (M. L. n. Prochloron type genus of the family; -aceae ending to denote a family; M. L. fem. n. the Prochloron family) are unicellular photosynthetic procaryotes, containing chlorophylls a and b, but not phycobilins. At present the family comprises a single genus Prochloron.

Prochloron Lewin 1977 gen. nov., nom. rev. Prochloron Lewin 1977 gen. nov., nom. rev. (formerly included as type genus of the division Prochlorophyta Lewin 1976) (Pro.chlo'ra'nom; M. L. n. Gr. pref. pro before [primordial]; Gr. adj. chlo'rus green; M. L. neut. n. Prochloron the primordial green) cells are motile or not motile, spherical, gram-negative cells multiplying either by binary fission or by asymmetrical division; 6 to 25 μm in diameter, surrounded by a peptidoglycan wall; thylakoidal stacks are present around the periphery of the cell, forming a network interconnected by fine strands. Aerobic or microaerophilic. Ascidian symbionts or free living. Nonsymbiotic growth is poor and dependent on aminoacids. Photoautotrophic or photoorganotrophic metabolism. The mol% G+C of DNA ranges from 39 to 41. Type species: Prochloron didemni (di.de'mni sp. nov., nom. rev. Prochloron didemni (di.de'mni sp. nov., nom. rev. Prochloron didemni (di.de'mni sp. nov., nom. rev. Prochloron didemni (di.de'mni sp. nov., nom. rev. Prochloron didemni Schulte-Baldes and Lewin 1976) [24] [this description is based on the type material, because no pure cultures have been maintained in the laboratory for more than two or three transfers]) are nonmotile, spherical, gram-negative cells, measuring 7 to 14 μm in diameter, multiplying by binary fission. Depending on conditions and host, cells may occur as green patches on the outer surfaces of animal colonies or in their common cloacal cavities, embedded in the material of the tunic. The symbiosis seems to be obligate. Thylakoids are either dispersed through the cell or concentrically arranged in the outer zones, around the thylakoid-free central body, and are generally appressed in pairs. The surfaces of thylakoids are smooth internally and externally. Ratios of chlorophyll a to chlorophyll b range from 2:6 to 10, according to various sources. Carotenoid complement is made up of β-caroteine (about 70%), an unidentified xanthophyll similar to zeaxanthin (25%), and in smaller amounts, several other carotenoids. Habitat is on or within the colonies of different ascidian didemnids in subtropical or tropical coastal waters, where the temperature rarely falls below 20°C. A rational basis for differentiation of other species should await further work with cell chemistry and physiology of future isolates.

LITERATURE CITED

27. Stanier, R. Y., and C. B. Van Niel. 1962. The concept of