NOTES

Higher Taxa of the Phototrophic Bacteria: *Chloroflexaceae* fam.nov., a Family for the Gliding, Filamentous, Phototrophic "Green" Bacteria

HANS G. TRÜPER

Institut für Mikrobiologie der Universität Bonn, 53 Bonn, Federal Republic of Germany

A new family name, *Chloroflexaceae*, is introduced for the phototrophic, gliding, filamentous bacteria containing chlorobium vesicles and bacteriochlorophylls *c* and *a*. The type genus in *Chloroflexus* Pierson and Castenholz with type species *Chloroflexus aurantiacus* Pierson and Castenholz 1974.

The higher taxa of the phototrophic bacteria (excluding the blue green, or cyano-, bacteria) have been redefined and newly arranged (10, 11) on the basis of the validly published and legitimate family names within this group.

Pierson and Castenholz (12, 13) described and named a new genus, *Chloroflexus*, and a new species, *C. aurantiacus*. Although the cells of the new species contain typical chlorobium vesicles as well as bacteriochlorophylls *c* and *a*, these bacteria are strikingly different from the genera so far included in the family *Chlorobiaceae* (1-4, 7-9, 12-14; S. Bauld, Ph.D. thesis, Univ. of Wisconsin, Madison, 1973; B. K. Pierson, Ph.D. thesis, Univ. of Oregon, Eugene, 1973). The main differences from the members of the family *Chlorobiaceae* are the gliding motility (1; J. Bauld and B. K. Pierson, Ph.D. theses), filamentous growth, flexibility of the cell wall (i.e., properties typical of flexibacteria and the filamentous cyanobacteria), preference for photoorganoheterotrophic growth (2, 4, 9), a capacity to grow well under aerobic conditions in the dark (i.e., to generate energy by respiration) (14), storage of poly- β -hydroxybutyrate, and carotenoid composition (the main carotenoid of the *Chlorobiaceae*, chlorobactene, is absent, whereas β -carotene is the major carotenoid) (7) of the new species.

The main properties that the new species has in common with the members of the family *Chlorobiaceae* are the possession of chlorobium vesicles and the presence of bacteriochlorophylls *c* and *a* (12, 14). In addition, the phospholipid and glycolipid constituents of the cells are rather similar and distinguish both groups from other phototrophic bacteria (8).

However, the differences between the two groups are here regarded as sufficiently significant to warrant placing *Chloroflexus* in a new family, *Chloroflexaceae*. This family together with the *Chlorobiaceae* forms the suborder *Chlorobiineae* of the *Rhodospirillales*. The scheme previously proposed by Pfennig and Trüper (10) is thus emended as shown in Fig. 1. Definitions of the order *Rhodospirillales* and the suborder *Rhodospirillineae* with its two families were given by Pfennig and Trüper (10, 11). The definition of the suborder *Chlorobiineae* is hereby emended as follows: phototrophic bacteria, in the sense of *Rhodospirillales*, containing chlorobium vesicles and bacteriochlorophyll *c*, *d*, or *e* (7) besides smaller amounts of bacteriochlorophyll *a*. The type family is *Chlorobiaceae*.

The family *Chloroflexaceae* is then defined as: phototrophic bacteria containing chlorobium vesicles and bacteriochlorophyll *c*, *d*, or *e*

FIG. 1. Emendation of scheme proposed previously by Pfennig and Trüper (10).

besides bacteriochlorophyll *a*; the cells have a gliding motility, the cell walls are flexible, and the growth is filamentous. The type genus is *Chloroflexus* Pierson and Castenholz.

At this state of our knowledge, it would not make sense to elevate the predominant photoorganoheterotrophic ability of *Chloroflexus aurantiacus* to a family-level property. The same holds for its capacity to grow aerobically in the dark and for its extreme thermophily so far found in all strains of this species (1–3, 12–14; J. Bauld and B. K. Pierson, Ph.D. theses).

Very recently, the genus *Chloronema*, which may belong to *Chloroflexaceae*, was described by Dubinina and Gorlenko (5). However, because no pure cultures have been obtained, the taxonomic position of this new genus and its two new species, *C. giganteum* and *C. spiroideum*, remains undetermined.

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REPRINT REQUESTS

Address reprint requests to: Dr. Hans G. Trüper, Institut für Mikrobiologie der Universität Bonn, Meckenheimer Allee 168, 53 Bonn, Germany.

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