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A Diversity and Phylogeny of Hypotrichous Ciliates (Protozoa, Ciliophora, Hypotrichida)

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Ciliated protozoans are one of the most diverse group of protozoan (about 8,000 species have been described) and known to have complex cellular organelles that have been described but these organisms are considered as a monophyletic group within the protozoan protists up to now. One of the characteristic features of ciliates is nuclear dualism, possessing a macronucleus and micronucleus. Whereas ciliates have long been considered as a monophyletic group, relationships within this group have been the subject of a continuous debate and numerous conflicting classifications based on morphological, developmental and ultrastructural studies. The taxonomic scheme and phylogenetic relationship of hypotrichous ciliates within the ciliate group is still debating and uncertain. To assess the phylogenetic relationships of hypotrichous ciliates and related ciliates, the complete sequences of small subunit ribosomal RNA (ssu-rRNA) genes of ciliates were analyzed using several phylogenetic analysis packages. For this purpose, seven species of hypotrichous ciliates, *Paraurostyla weissei*, *Uroleptus pisci*, *Euplotes aediculatus*, *Tachysoma pellionellum*, *Holosticha kesseleri*, *H. multistylata*, and *Stylonychia mytilus*, were isolated and cultured and their ssu-rRNA genes were sequenced using standard molecular techniques. The sequences of ssu-rRNA gene of the other ciliates were retrieved from world wide databases. One of the primitive protozoan, *Labyrinthuloides minuta*, was used as an outgroup for the phylogenetic analysis. The reconstructed tree demonstrated that the hypotrichous ciliates formed a monophyletic group within the global ciliate tree, and the members of this group composed of all hypotrichs and one oligotrichous ciliate. This monophyletic group (Hypotrichida) was divided into three main lineages or clades: *Euplotes* line, *Euplotidium*-*Diophrys* line and *Oxytricha*-*Stylonychia*-*Onychodromus*-*Holosticha* line. The Hateria (considered as a member of oligotrichs previously) allied more closely with a clade (*Oxytricha*-*Stylonychia*-*Onychodromus*-*Holosticha*) than with other clades.