

Symbiotic associations in ciliates and the holobiont concept

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The term "holobiont", proposed by Lynn Margulis, implies any host with all its symbiotic microorganisms, producing a polygenomic entity. According to this concept, each holobiont has its hologenome, which is subject to evolutionary changes and is a single unit of natural selection. Eagerly accepted by many scholars, the holobiont approach often draws criticism from the advocates of the ecological approach, considering the host-microbiome system as an ecological community, where its members experience different selective pressures and vary in their fidelity to the association. Ciliates offer a plethora of symbiotic associations with microorganisms, which differ in host fidelity, transmission mode, and system stability. The talk addresses the issue of applicability of the holobiont concept to the symbiotic associations in ciliates. Should all of them be regarded as holobionts? If not, which symbiotic systems in ciliates could be regarded as true holobionts? Whether such criteria as host fitness, system stability, transmission mode, lifetime presence, and host specificity should be taken into consideration to rank a particular host with its symbionts as a holobiont? Among the symbiotic associations discussed are fairly well studied systems like *Paramecium caudatum/Holospora obtusa* and *Euplotes aediculatus/Polynucleobacter necessarius*, recently described systems, such as *Paramecium multimicronucleatum/Trichorickettsia mobilis*, and newly found symbiotic associations in *Paramecium nephridiatum*.

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