
Towards an Understanding of the Killer Trait: *Caedibacter* endocytobionts in *Paramecium*

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1 Introduction

Bacteria of the genus *Caedibacter* are endocytobionts of *Paramecium*. Mostly, the endocytobionts colonize the cytoplasm and sometimes the macronucleus of a host cell (Fig. 1). Infected paramecia may be recognized by the fact that they release toxins produced by *Caedibacter* that kill sensitive paramecia. Paramecia bearing *Caedibacter* are therefore called “killers”. Host cells of *Caedibacter* are resistant against the toxins. This killer trait was first described by Sonneborn in 1938, who observed that sensitive paramecia exhibit distinct morphological symptoms upon ingestion of toxic particles (at that time designated kappa-particles) released by the killer strain and ultimately die (Sonneborn 1938). Evidences for a bacterial nature of the particles were found by Preer (1950), Hamilton and Gettner (1958) and Dippel (1958). After the initial discovery of killer bacteria, others were found that acted differently on sensitive cells. In the case of *Caedibacter*, the toxic effect is associated with refractile inclusion bodies (R bodies) found inside the bacteria (Schmidt et al. 1988). R bodies consist of highly insoluble protein ribbons (Fig. 2). They unwind under certain conditions and are associated with the toxicity of the bacteria. Besides *Caedibacter*, several free-living bacteria were found, too, that have the ability to produce R bodies.

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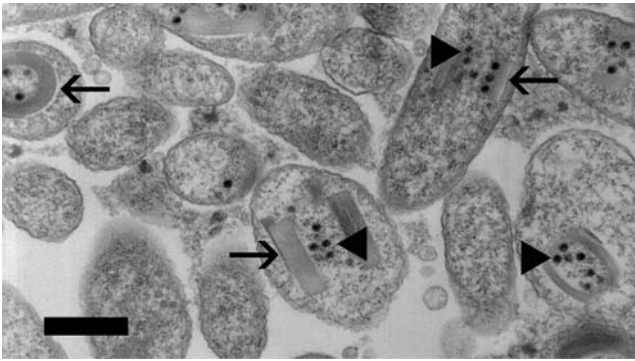


Fig. 1. Cluster of *Caedibacter caryophilus* in the macronucleus of *Paramecium caudatum*. Some bacteria contain R bodies (arrows) with phage capsids (arrowheads). Electron micrograph, courtesy of Michael Schweikert, University of Stuttgart. Bar 0.5 μm

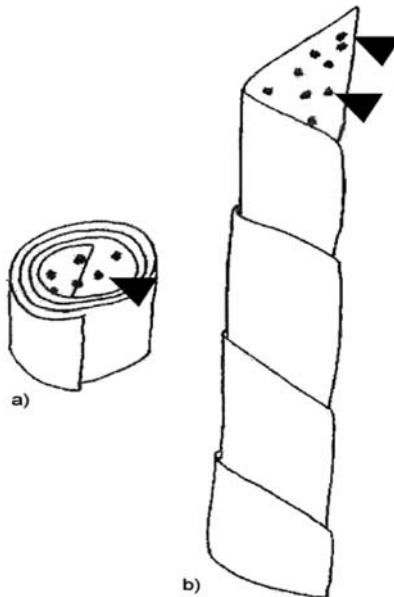


Fig. 2. R bodies are coiled protein ribbons that are refractile in phase contrast. **a** The unrolled ribbons have a length of up to 20 μm and a width of 0.4 to 0.8 μm . **b** By appropriated triggers, such as low pH, they are induced to unroll. Certain R bodies are associated with phage capsids (arrowheads)