# Cellulosomes – Promising Supramolecular Machines of Anaerobic Cellulolytic Microorganisms

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## Abstract

Cellulose is the main structural component of plant cell wall and thus the most abundant carbohydrate in nature. However, extracting the energy from this abundant source is limited by its recalcitrant nature. The hydrolysis of plant cell wall requires synergystic action of different enzymes, including multiple cellulases, hemicellulases, pectinases, etc. Meanwhile aerobic cellulolytic microorganisms release large quantities of synergistically acting free enzymes in their environment, most anaerobic microorganisms evolved more efficient strategies to optimize the process of plant cell wall degradation, for example production of extracellular multi-enzyme complexes (cellulosomes). Cellulosomes consist of at least one core structural protein, named scaffoldin, which firmly binds numerous enzymatic subunits, and usually also plays a major role in substrate binding. Although the general structure of cellulosomes seems universal, differences in number and identity of complex components do exist among microorganisms. The article surveys the current knowledge about cellulosomes, focusing on three best investigated cellulolytic clostridia, one representative of ruminal bacteria and novel findings concerning anaerobic fungi. Efforts in construction of artificially engineered cellulosomal systems (designer cellulosomes) as well as their biotechnological potential are also discussed.

**Keywords:** Cellulose degradation, microorganisms, enzyme complexes, cellulosomes, biotechnology