

Designer cellulosomes as a broad platform for synthetic biotechnology



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Abstract

An attractive prospect for biomass conversion involves the multi-enzyme cellulosome complex, which exhibits enhanced levels of synergy to degrade cellulosic substrates. In contrast to the free enzyme paradigm, the cellulosome complex comprises a set of Lego-like multi-modular components – some structural and some enzymatic. Our lab has focused on dismantling the cellulosome into its component parts and reassembling them into “designer cellulosomes” of precise enzymatic content and configuration. Rational bioengineering of the tailor-made complexes has been developed for improved cellulose degradation. Recent efforts to prepare more thermostable complexes have led to the development of hyperthermostable designer cellulosomes. Integration of alternative enzymes and/or noncatalytic macromolecules render the designer cellulosome concept a general platform for self-assembly of biologically active nanomaterials.

Brief Biography

Ed Bayer is a professor in the Department of Biomolecular Sciences at the Weizmann Institute of Science, Rehovot, Israel. His early work focused on the early development of the avidin- and streptavidin-biotin system as a general tool in the biological sciences, and he received the Sarstedt Award (1990) for his contributions to this field. He is co-discoverer of the cellulosome concept and has pioneered the development of designer cellulosomes for research and biotechnological applications. In 1999, he founded and chaired an ongoing Gordon Research Conference on this subject, which celebrated its 20th anniversary this year. He is the recipient of The Ulitzky Prize (2006) from The Israel Society for Microbiology on his work in this area.

He has authored over 450 articles and reviews in both fields. He co-edited *Methods in Enzymology* Volume 184 on "Avidin-biotin technology", is Editor-in-Chief of *Biotechnology Advances*, Section Editor on Bacterial Genetics and Metabolic Engineering of *Biotechnology for Biofuels*, and serves on the editorial board of several other biotechnology- and microbiology-oriented journals, including *Environmental Microbiology* and *Current Opinion in Biotechnology*. He served for a decade on the scientific advisory board of the US DOE BioEnergy Science Center (BESC), and was recently named Visiting Professor at the Beijing University of Chemical Technology. He is an elected Fellow of both the American (2001) and the European (2013) Academies of Microbiology.