Characterization and engineering of two new GH9 and GH48 cellulases from a Bacillus pumilus isolated from Lake Bogoria

Abstract

Objectives

To search for new alkaliphilic cellulases and to improve their efficiency on crystalline cellulose through molecular engineering

Results

Two novel cellulases, *Bp*GH9 and *Bp*GH48, from a *Bacillus pumilus* strain were identified, cloned and biochemically characterized. *Bp*GH9 is a modular endocellulase belonging to the glycoside hydrolase 9 family (GH9), which contains a catalytic module (GH) and a carbohydrate-binding module belonging to class 3 and subclass c (CBM3c). This enzyme is extremely tolerant to high alkali pH and remains significantly active at pH 10. *Bp*GH48 is an exocellulase, belonging to the glycoside hydrolase 48 family (GH48) and acts on the reducing end of oligo-β1,4 glucanes. A truncated form of *Bp*GH9 and a chimeric fusion with an additional CBM3a module was constructed. The deletion of the CBM3c module results in a significant decline in the catalytic activity. However, fusion of CBM3a, although in a non native position, enhanced the activity of *Bp*GH9 on crystalline cellulose.

Conclusions

A new alkaliphilic endocellulase *Bp*GH9, was cloned and engineered as a fusion protein (CBM3a-*Bp*GH9), which led to an improved activity on crystalline cellulose.

Authors.

Lydia A. Ogonda, Amélie Saumonneau, Michel Dion, Edward K. Muge, Benson M. Wamalwa, Francis J. Mulaa & Charles Tellier