

Engineering *N*-terminal end of CelA enhances the cellulolytic activity of *Caldicellulosiruptor bescii*

Background

- CelA is the most abundant enzyme secreted by *C. bescii* and has been shown to outperform mixtures of commercial exo- and endoglucanases *in vitro*.
- Changes in the *N*-terminus outside the signal sequence have a dramatic effect on transport of exported proteins.
- Highly secreted proteins typically possess a negatively charged residue in the first five amino acids.

Approach

- To test whether alteration of the *N*-terminal terminus of CelA GH9 and CelA GH48 domains might improve secretion and/or catalytic efficiency of CelA, repeating aspartate tags were introduced into the *N*-terminal ends of these 8 domains.

Outcome

- Introduction of repeating aspartate tags resulted in an increase in the general activity of the exoproteome and a dramatic increase in growth of *C. bescii* on crystalline cellulose (see histograms).

Significance

- Most efficient cellulase systems contain highly active exocellulase enzymes capable of decrystallizing cellulose, so the observed increase in activity on Avicel bears directly upon the ability of CelA to degrade realistic biomass feedstocks destined for biofuels production.

