

VTIP Case number 09-095: Recombinant Gram-positive Microorganism Growing on Cellulose as the Sole Carbon Source in Defined Media

Institution: Virginia Tech; IP assigned to Virginia Tech Intellectual Properties, Inc.
VT Department: Biological Systems Engineering

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This invention provides the genetic engineering technologies and the defined media to convert gram-positive microorganisms for a low-cost, consolidated bio-processing (CBP) platform. This technology can be applied for producing advanced biofuels and other bio-based products with lignocellulosic material as feedstock in the defined media without any expensive organic nutrients and cellulases.

Competing technologies such as yeast, e-coli, or gram-negative microorganisms are less compelling solutions as compared to recombinant cellulolytic *Bacillus* for the following reasons:

- generally regarded as a safe (GRAS) microorganism and free of any endotoxin
- aerobic CBP microorganism that can generate sufficient ATP and NAD(P)H for production of high-energy-density biofuels and products
- exhibits a fast growth rate and requires a low-level of nutrients to achieve this
- utilizes hexose and pentose sugars, as well as contains its own hemicellulase and the ability to use hemicellulose
- tolerates inhibition from high concentration of salts and solvents

In addition to the above-referenced advantages, Dr. Zhang and his team have also acquired knowledge on many different attributes related to *Bacillus*, such as: genome sequence, transcription, translation, protein folding and secretion mechanisms, genetic manipulation, and large-scale fermentation. Finally, *Bacillus* strains only degrade pretreated biomass as opposed to natural biomass.

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