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Advanced molecular techniques to improve the activity and production of lignocellulases

Many interesting and important tests are stopped at protein preparation from a target gene and the industrial applications of lignocellulases are hindered by the high costs of enzyme production. A gene expression system of *E. coli* and pHsh was constructed to enhance the production of recombinant enzymes by using the consensus promoter of heat shock (Hsh) proteins. The target gene in pHsh is under the control of an alternative sigma factor σ^{32} and its expression is induced by a temperature up-shift. The presence of pHsh increases σ^{32} concentration in *E. coli* cells, which could strengthen the transcription of heat shock chaperons. Therefore, pHsh exhibits advantages in allowing healthful growth of recombinant cells, increasing production of target protein and decreasing inclusion body formation. Based on pHsh system and mediated by a thermo-stable DNA ligase, *in situ* error-prone PCR technique has been developed to perform directed evolution in a step of PCR amplification and plate selection. Combining the techniques of pHsh expression, site-directed mutagenesis and directed evolution, we are able to modify genes coding for lignocellulases with desired properties, e.g. the genes encoding extremely thermo-stable xylanase and laccase have been improved and enzymes can be efficiently produced for bio-bleaching pulp at high temperatures. These advanced techniques will enhance the biodegradation of lingo-cellulosic biomass for the industrial applications of bioenergy.

Biography

Weilan Shao has completed her PhD at University of Georgia and Post-doctoral studies at University of Wisconsin. She has been a distinguished Professor at Jiangnan University, Nanjing Normal University and Jiangsu University in China since 2000. She and her group have discovered a series of novel lignocellulases, the key aldehyde dehydrogenase for ethanol formation, the repressor/operator system coupling glycolysis and fermentation pathways, and the regulation mechanism of thermophilic ethanol fermentation. She has also invented new technique for industrial enzyme production and modification.

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