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Structure and function of enzymes and auxiliary proteins from Trichoderma, active in cell-wall hydrolysis

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Área do conhecimento: Ciências Biológicas - Biofísica - Biofísica Molecular

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Auxílios(s) vinculado(s): 10/18849-4 - Purificação e caracterização de hidrolases de glicosídeos, produzidas pelo fungo filamentoso Trichoderma harzianum, com perspectiva de aplicabilidade dessas enzimas em coquetéis para hidrólise da biomassa e produção de bioetanol, AV.EXT

Bolsa(s) vinculada(s): 13/15582-5 - Dinâmica molecular em múltiplas escalas de glicosídeo hidrolases e substratos lignocelulósicos, BP.PD
13/13766-1 - Estrutura e função de enzimas e proteínas auxiliares de Trichoderma, atuantes na hidrólise da parede celular, BP.TT
12/17298-0 - Apoio técnico ao grupo de biotecnologia molecular do Instituto de Física de São Carlos, IFSC/USP, BP.TT
+ mais bolsas vinculadas

Convênio/Acordo de cooperação com a FAPESP: CNPq - Temáticos - Pronex

Publicação FAPESP sobre o auxílio: http://media.fapesp.br/bv/uploads/publicacoes/pasta_bioen_jun2012_70.pdf

Assunto(s): Biologia molecular Fungos mitospóricos Trichoderma Enzimas

Resumo

Lignocellulosic biomass, such as sugarcane bagasse, holds a promise of environmentally friendly bioenergy production in Brazil. However, enzymatic hydrolysis, currently considered a method of choice in biomass saccharification, is hampered by considerable cell-wall recalcitrance. To make this technology sustainable and cost effective, our comprehension of cellulose enzymatic hydrolysis should be significantly improved. Here we propose to conduct systematic structure-functional studies of Trichoderma cellulases and auxiliary proteins active in cell-wall degradation using a combination of X-ray protein crystallography, biophysical and biochemical studies, molecular dynamics simulations, statistical coupling analysis aligned with the site-directed mutagenesis and enzymatic assays aiming to obtain in-depth comprehension of cellulose hydrolysis. We plan to contribute toward structural analysis of Trichoderma reesei endoglucanases by solving a crystal structure of endoglucanase II (Cel5A), main enzymatically active, but structurally uncharacterized endoglucanase of this important industrial fungus. Moreover, we will contribute toward our knowledge of Trichoderma cellulases molecular organization by solving X-ray structures of main Trichoderma harzianum endo- and exoglucanases (primarily focusing on Cel7A and Cel5A) and by comparing them with the correspondent T. reesei enzymes. We also aim to structurally characterize swollenins, non-hydrolytic proteins, shown to enhance cellulose hydrolysis catalyzed by celulases, and to study

thermodynamically its interactions with cellulose. In addition, we will construct chimeric enzymes by fusing of swollenin with the cellulases and will study enzymatic properties of such chimeras. Furthermore, we will conduct systematic molecular dynamics studies of the cellulases and swollenin, and investigate their flexibility by hydrogen deuterium exchange followed by massspectrometry. Finally, we will use all these acquired knowledge to modify the proteins using site-directed mutagenesis aiming to better comprehend molecular basis of their function and to produce enzymes and their mixtures with enhanced hydrolytic properties. (AU)

Matéria(s) publicada(s) na Agência FAPESP sobre o auxílio:
Aprimorar coquetéis enzimáticos é caminho para etanol celulósico

PUBLICAÇÕES CIENTÍFICAS (16)
(Referências obtidas automaticamente do Web of Science e do SciELO, por meio da informação sobre o financiamento pela FAPESP e o número do processo correspondente, incluída na publicação pelos autores)

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