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CellulosomePlus, grant agreement 604530

Call Identifier: FP7-NMP-2013-SMALL-7

Designer Cellulosomes To Enhance Saccharification of Lignocellulosic Biomass Residues

The project runs from 01/11/2013 till 31/10/2017. EU contribution 369 000 EUR.

CellulosomePlus targets rational design of cellulosomes (CSs), natural nanocatalysts, to overcome the major bottleneck for biomass processing: saccharification (conversion of cellulosic biomass to fermentable sugars). This would allow the efficient production of added-value chemicals such as biofuels from low-value raw materials like inedible parts of plants and industrial residues, which are all renewable, sustainable and inexpensive. In particular, we propose to characterize natural CS and non-CS components capable of degrading two suitable industrial substrates (wheat straw and corn stover) to design new CSs with improved efficiency (high-selectivity, activity and cost-effectiveness) for saccharification, en route to the production of added-value chemicals like biofuels (of the so-called 2nd generation). CellulosomePlus addresses the major drawbacks of
conventional processes. Improved CSs represent a step towards Green Chemistry since they are biodegradable
proteinaceous materials, and therefore by-products or waste generated are minimized due to the high selectivity of their enzymes. Fundamental studies will initially focus on producing and characterizing enzymes and scaffolds of the CS, by studying their physicochemical and structural properties as well as their interactions. In addition, the selected agro-food industrial substrates will be characterized, and appropriate assays will be generated to reliably follow the activity of the designed CS. Our innovative multidisciplinary approach will take also into account the mechanical stability of CS components and perform theoretical modeling for rapid computational prediction and atomic-level characterization, complementing and improving the interpretation of experimental results. Finally, the knowledge produced will be integrated (at the pre-industrial scale) to fulfill our main objective: to design both an optimized CS (and associated process) to efficiently degrade biomass substrates to fermentable sugars.

Partners of the consortium:

Consejo Superior de Investigaciones Cientificas (CSIC), Spain
Weizmann Institute, Department of Biological Chemistry, Israel
Ludwig Maximilian Universitat, Physik und Center for NanoScience
Institute of Physics Polish Academy of Sciences, Poland
Centre National de la Recherche Scientifique, Station Biologique de Roscoff, France
University of Limerick, Ireland – subcontractor to Institute of Physics
Designer Energy (a company involved in production of sugar from biomass), Israel – subcontractor of the Weizmann Institute
Abengoa Bioenergia (a company involved in production of bioethanol), Spain
Biopolis (a biotechnology company), Spain