Overcoming the digestibility barrier in lignocellulosic plant biomass

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The production of cost-competitive sugars from lignocellulosic biomass may be the biggest challenge facing second generation biofuel production. The high costs of pretreatments that are needed to prepare the biomass for digestion by cellulases and the high enzyme loadings needed for effective saccharification make this hard to achieve. In this talk, I will summarise what we understand about the basis of lignocellulose recalcitrance and give a flavour of work in my research group that is aimed at producing modified lignocellulose that is easier to convert into sugars, and discovering new lignocellulose-active enzymes from unusual environments to improve our ability to mobilise sugars from this substrate. I will describe how the development of a sensitive high-throughput automated assay for lignocellulose digestibility has allowed us to identify genes that can be modified to improve digestibility without negative impacts on plant performance. I will also describe how our research on marine wood borers is identifying new enzymes and mechanisms for lignocellulose deconstruction.