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Genozymes for Bioproducts and Bioprocesses Development

Status	Approved
Competition	Applied Genomics in Bioproducts or Crops
Sector	Environment
Genome Centre	Genome Quebec
Project Leader	Adrian Tsang, Concordia University

Project Description

To move from a fossil-fuel based economy to a bioeconomy based on converting plant material into energy, researchers need to isolate the proteins involved in the process that converts woody biomass (lignocellulose) into simple sugars. Those sugars are the basic blocks required to build the advanced biofuels and biochemicals that can turn agricultural and urban waste into products and energy.

Fungi play a natural role in decomposition. They break down woody biomass, which includes limbs, tops, needles, leaves, bushes and shrubs, into sugars. That makes fungi an ideal natural laboratory where we can search for the proteins involved in this process, which we aim to harness and duplicate.

Our project will use the massive amounts of information available from genome research to identify, analyze and develop potential enzymes in fungi that we could use as catalysts to produce biofuels and other plant-based products. We will map the genome of important fungi and identify the enzymes, or proteins, they use to break down the biomass. We will build a database of the genes and genomes of various types of fungi, as well as the enzyme families and the properties and applications for those proteins. We will clone and express these proteins in the large volumes needed for industrial use. We will also modify promising enzymes to adapt their properties to the requirements of industrial settings. We will use them to develop new fuels, chemicals and novel processes for pulp and paper manufacturing and the production of cattle feed. We will also establish new standards to measure the sustainability of converting woody biomass to biofuels and other products. Finally, we will develop effective communications strategies to engage the Canadian public in a conversation about issues associated with using biomass as a key source of chemicals and fuels in the future.

Once we have developed new enzymes, they will become the cornerstones for the development of large-scale industrial biorefineries that process biomass into biofuels and biochemicals. We also plan to develop enzyme supplements to use in cattle feed, reducing the amount of grain necessary to ensure a nutritious feed product. That development would stabilize the cost of feed

for farmers and could cut food costs overall. The enzymes we develop will also help the pulp and paper industry reduce the amount of energy it requires and the pollution the pulping process generates.