Prade

Dr. Rolf A. Prade is a faculty member at the Oklahoma State University that teaches a variety of courses and labs. Dr. Prade discovered that fungi are important enzyme producers, and that fungi have the potential to make the enzymes that the renewable energy resource comminuty needs.

Dr. Prade is currently working on a ten-year-old project. His team is trying to prove the hypothesis that not all covalent bonds in polymers are broken down by hydrolytic mechanisms. He and his team tried to suggest that oxidation of covalent bonds is an alternative over hydrolysis just because oxidations does not involve a water molecule.

Biomass is an abundant, reusable, and beneficial source for the production of biofuels. Biomass is also used for chemical priming of certain plastics and composites. The deconstruction of the biomass by enzymes is recognized as intractable, while an inclusive breakdown mechanism remains to be discovered. Lignocellulosic biomass polymers are a large and reusable source for the assembly of biofuels, they trap at least 60 percent of sugars supplied by plants. Man-made lignocellulosic biomass piles up alongside biorefineries (which are refinery that is able to transform energy from biomass into byproducts) and could be broken down enzymatically

A fungi named Myceliophthora *thermophila* M77 appears to be able to decompose a natural biomass source very well. The work reports on this fungus, its fermentation property during its production of cellulolytic enzymes is using natural biomass substrates. There is little hydrolytic activity that was detected, this lead to an insufficient explanation of the large amount of biomass reduced in the process. This work makes a comprehensive amount of extracellular proteins and they describe how secretomes redirect their qualitative protein content, which is based on the nature and chemistry of its nutritional source.

Cellulose degrading enzymes are produced by microorganisms that try to use this polymer as a carbon source most microorganisms produce at least three types of glycosidic bond breaking enzymes; cellobiohydrolases, endo-glucanases, and β-glucosidases.

Recently oxidoreductase enzymes such as polysaccharide monooxygenases (PMO’s) that directly oxidize glycoside bonds generating aldones and lactones have been discovered highlighting the role of oxidation reactions in the breakdown of biomass components

Secretomes are produced on a natural biomass which it displayed a comprehensive set of enzymes which is involved in hydrolysis and oxidation of cellulose, hemicellulose-pectin and lignin. Participation of oxidation reactions coupled to lignin decomposition in the breakdown of natural biomass may explain the discrepancy observed for cellulose decomposition in relation to natural biomass fermentation experiments.

There are other hypotheses that were suggested. They hypothesize that fungi secrete their enzymes, that they are so abundant, and through vesicles that leave the surrounding of a fungal hypha and move throughout space searching for a landing site. The landing site could be a substrate, another cell.

Even though they were not able to attract funding to this subject they still published several articles furthering this new field of biochemistry. Today, they are developing a new idea based on the determination that vesicles are involved in intercellular communication not only between cells of a given organisms, but also between cells of different organisms.