

Reardon Group
Undergraduate Research Position

ISOLATION AND CHARACTERIZATION OF NOVEL LIGNIN-DEGRADING OR LIGNIN-MODIFYING MICROBES FROM RAINFOREST SOILS
Mentor: Dr. Xingfeng Huang, Postdoctoral Researcher

PROJECT DESCRIPTION

The goal of this project is to isolate and characterize novel microbes and enzymes to break the recalcitrance of cellulosic biomass through selective lignin removal in pretreatment for biofuel production. The discovery and characterization of efficient microbes and enzymes with high preferential activity on lignin could provide a viable and more environmentally friendly biomass pretreatment process.

Pretreatment to remove or alter the structure of lignin to result in higher availability of carbohydrates for subsequent enzymatic hydrolysis is a crucial step to reduce plant biomass recalcitrance for biofuel production. Common pretreatment methods currently used are physical and/or chemical treatments that are costly, require large amounts of energy, and produce undesirable compounds. Therefore, the use of lignin-degrading microbes (and the enzymes derived from those microbes) for removal of lignin, which need low energy requirements and no chemical additions, has great potential to make biomass pretreatment commercially viable.

The tropical rainforest soil is one of the most biodiverse places on earth. Although the rainforest soils are very poor and acidic, they support a rich diversity of vegetation that is maintained by the fast turnover of decaying plant biomass by highly specialized microbes. About 140 bacterial isolates and more than 500 fungal isolates have been isolated from the soil in the Peruvian Rainforest of Tambopata. We are currently using this microbial diversity to identify microbes and isolates enzymes that are efficient in biomass degradation.

Ongoing experiments involve the screening and characterization of highly efficient bacteria from this collection for the ability to degrade lignin and the presence of laccases, one of the major oxidative enzyme classes capable of lignin biodegradation. Some bacterial strains that show positive results in the activity screening tests have been cultivated in different liquid media and optimized for cultivation. We will screen the rainforest soil fungal and bacterial libraries by growing them on different lignin model dimer compounds. Furthermore, promising strains discovered through activity screens will be investigated for the ability to degrade or modify lignin from biomass types.

QUALIFICATIONS

Required: Basic knowledge about microbiology and biochemistry.

Desired: Lab work experience in microbiology, biochemistry, and molecular biology. Training will be provided to acquire the necessary laboratory techniques.

Note: Hazardous waste training will be required for this position with training provided through CSU's Environmental Health Services program.

START DATE

This position is available immediately.

QUESTIONS AND APPLICATION

Send questions and a Reardon Group Undergraduate Research application form (next page) to: Dr. Xingfeng Huang, xingfeng.huang@colostate.edu

Application for undergraduate research position in the Reardon Group
(please return this form to the contact person shown for the specific position)

Which project are you applying for?

Name:

Email address:

Major:

Minor(s) (if any):

Expected graduation date:

1. What course topics do you like the most?

2. Are there particular research topics that interest you?

3. At this time, what are your career goals?

4. Have you thought about attending graduate school? In what field(s)?

5. What do you want to accomplish in a research project? (i.e., why do you want to do this?)

6. When would you like to participate in a research project?
 - Spring 2012
 - Summer 2012
 - Fall 2012
 - Spring 2013
 - Other:

