BOSTON UNIVERSITY ACADEMY

Title: Metabolic Models of Enterobacter Strains and Their Potential to Degrade Lignin

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Abstract:

This paper will discuss the construction of metabolic models for Enterobacter ludwigii (EcWSU1) and Enterobacter cloacae (EcRC202), commonly found in rotting/decaying onions. Enterobacter ludwigii is a subspecies of Enterobacter cloacae, which is what EcWSU1 was initially classified as. Enterobacter cloacae is an emerging opportunistic human pathogen that is associated with nosocomial (hospital-acquired) infections, it occurs more often and is more dangerous in individuals whose immune system has been compromised. The two species share many properties, but there is significantly less literature on Enterobacter ludwigii. The ultimate goal of this project is to explore whether the Enterobacter bacteria can degrade lignin, which would provide an alternative energy source to burning fossil fuels. Lignin is a carbohydrate that gives plants their shape and stability. It is the most abundant polymer found in plants, and if it could be broken down effectively, it could be a great fuel resource. The models were created and gapfilled using the KnowledgeBase (KBase) platform. The computer program used to test the metabolic models is called COMETS (Computation of Microbial Ecosystems in Time and Space). After entering the metabolic model of a certain bacterium as well as the environment - growth medium volume and metabolite concentrations - COMETS tracks total bacteria biomass along with the concentrations of individual metabolites over time. The COMETS simulations have been used to model the growth of Enterobacter strains in various environments to make sure the program is producing results that are consistent with the in vitro tests. The EcWSU1 and EcRC202 models gave accurate biomass results with some modifications.