Conversion of Chitin Monomers (n-Acetyl Glucosamine) to Value-Added Products.

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Seafood production in the United States is continually being eroded by imports from Asia and South America due in large part to these areas ability to produce seafood cheaper than the US. In a USDA document, shrimp imports reached a record 1.1 billion pounds in 2004. Proposed here is the development of processes that would reduce operational cost by eliminating some of the waste disposal costs while providing additional income streams from the sale of other products generated from their waste. Yeasts are excellent candidate organisms for the bioprocessing for this type of waste because they possess much of the enzymatic machinery to break down the organic constituents that make up this feedstock such as the chitin and proteins. Another attractive feature that these yeast posses is the ability to accumulate up to 60% of their dry mass in triglycerides. Recent preliminary work at MSU has demonstrated that *Rhodotorula glutinis* can produce oil while growing on n-acetyl glucosamine (chitin monomers). The lipids generated by this process could be sold directly into the lipid market for use in paint formulation like the one used in Southern Pride, a University of Southern Mississippi invention, the production of polymers, or the production of biodiesel. For example the 165,000,000 lbs of seafood processing waste could be used to produce an estimated ~12,000,000 gallons of biodiesel. In addition to lipids, biodiesel, and glycerol produced by these microorganisms a significant amount of protein will also be generated. The protein left after the lipids have been harvested from these microorganisms could find a market as an animal feed.

The overall objectives of this study would be to determine the most effective process for converting the carbon in the seafood processing waste into triglycerides and feed-grade protein by oleaginous yeast. More specifically the study would address the following issues 1) determine the optimum condition for oil production by oleaginous yeast grown on n-acetyl glucosamine as the carbon, energy, and nitrogen source, 2) determine the effectiveness of several techniques to depolymerize the chitin contained in seafood processing waste, 3) determine the optimum condition for oil production by oleaginous yeast grown on depolymerized seafood processing waste as the growth medium, 4) identification of the fatty acids produced by the yeast on either n-acetyl glucosamine or seafood processing waste medium, 5) determination of the biodiesel quality of the oleaginous yeast produced oils, and 6) determine the feed value of the bioprocessing residuals.

The benefits of these results are several fold. First the development of this type of technology could revitalize a struggling industry by decreasing operational cost and provide an additional income stream. Second the development of a bioprocessing facility would generate desperately needed jobs along the Mississippi and Alabama Gulf Coast. Thirdly, this process would decrease the environmental impact this industry has by reducing the waste generated while concurrently providing fishing fleets with an environmentally friendly fuel.