IOWA STATE UNIVERSITY
Department of Chemical and Biological Engineering

Graduate Seminar Series 2018-2019

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On How to Convince Baker's Yeast to be a Less Picky Eater

Over the past two decades, there has been significant interest in engineering microbes to convert low-value and/or abundant resources to produce higher value products like fuels, chemicals, plastics, drugs, etc. Despite extensive efforts, success in engineering microbes to use nutrients they did not naturally evolve to utilize (i.e., non-native substrates) have been not as profound as everyone had hoped. Outcomes so far have indicated that microbes are generally picky-eaters and are reticent to consume unfamiliar substrates. For example, pentose (viz. xylose, arabinose), C1 (CO_2, methanol), Cn (cellulose, cellobiose) metabolism in the baker's yeast, Saccharomyces cerevisiae, is non-optimal, even after extensive engineering efforts compared to that of native C6 sugar nutrients like glucose and galactose Thus, there is significant need in the metabolic engineering and synthetic biology communities to answer the following questions:

1) Why has the current engineering paradigm not had greater success?
2) How do we engineer microbes to better assimilate substrates they did not naturally evolve to utilize?

In this talk, I will present results from our attempt to answer these questions using non-native pentose assimilation by the baker's yeast S. cerevisiae as a test case.

Nikhil (Nik) U. Nair received his B.S. in Chemical and Biomolecular Engineering from Cornell University (Ithaca, NY) in 2003, after which he had a brief stint at Bristol-Myers Squibb where he worked as a manufacturing research scientist in biotechnology purification development. He then went on to receive his M.S. and Ph.D. in Chemical and Biomolecular Engineering from the University of Illinois, Urbana-Champaign in 2006 and 2010, respectively, under the guidance of Prof. Huimin Zhao. As a graduate student, he developed processes for the production of the sugar substitute xylitol using E. coli and the biofuel butanol using yeast via a combination of protein and genome engineering approaches. He joined Tufts in 2013 after completing a three-year postdoctoral fellowship in Microbiology and Immunobiology at the Harvard Medical School under the guidance of Ann Hochschild. The Nair lab is interested in two major areas of research: engineering microbes for synthesis of renewable fuels and chemicals, and engineering probiotics and members of the gut microbiota to improve human health. He is a recipient of the 2016 NIH Director's New Innovator Award.

His professional memberships include the American Chemical Society, the American Institute of Chemical Engineers and the Federation of American Societies for Experimental Biology.

Thursday,

February 7, 2019

11:00 a.m.

171 Durham Center

Iowa State University