Immobilization of the Glutamine Binding Protein (QBP) onto the Surface of Transparent Microbeads for use in a Biosensor

Sean Najmi1,2, Sheniqua Brown M.S.1,2, Leah Tolosa PhD1,2
1Department of Chemical, Biochemical, Environmental Engineering, University of Maryland Baltimore County
2Center for Advanced Sensor Technology UMBC

Introduction

• Type 2 diabetes is a major risk factor for cardiovascular disease development (CVD) and affects over 310 million people worldwide1
• Circulating glutamine concentration is reduced significantly in patients with type 2 diabetes compared with healthy individuals2
• Currently there are no methods for non-invasive measurements of glutamine in human blood
• This study will look into expressing then using the Glutamine Binding Protein (QBP) immobilized on the surface of transparent microbeads to non-invasively measure glutamine concentrations

Figure 1: Glutamine Binding Protein. (A) shows QBP without any glutamine bound while (B) shows how the structure of QBP changes when glutamine is bound. Taken from Watanabe et. al. J. Am. Chim. Soc. 2003, 125, 6320-6326

Gellan Bead Synthesis

• Gellan beads were synthesized from KELCOGEL® Gellan gum and canola oil

• Reacted for 2 hours at 4°C and 1.5 hours at 20°C

• Beads were washed extensively with the main solvent, dioxane, before being combined with the protein

Gellan Bead Synthesis

Figure 2: Analysis showing QBP run through a 0.22 μm filter. The top is the expected peak removed from the protein and the bottom is the QBP that is collected and used for testing. 0.2 μM is a useful concentration for separation of the two occur...