

MONITORING MEMBRANE PROTEIN STRUCTURAL CHANGES AND INTERACTIONS VIA DEEP UV RESONANCE RAMAN SPECTROSCOPY

Mia C. Brown

Dr. Jason W. Cooley, Dissertation Supervisor

ABSTRACT

Membrane proteins perform a variety of functions within our cells. They transport nutrients and waste across the lipid barrier, transmit signals from one part of the body to another, and run our immune system. However, despite their ubiquitous and vital presence in all organisms, relatively little is known about this class of proteins compared to their soluble counterparts. In this work I have set out to use deep UV resonance Raman (DUVRR) spectroscopy to characterize structural and environmental transitions of proteins and applied the results to studies involving intramembrane proteases and their substrates. DUVRR has been used extensively to observe protein secondary structure. This work contains the results of three main studies I have conducted during my graduate career. In the first I show results from the first experiment to look simultaneously at both secondary and tertiary structure as a protein transitions from a molten globule to ordered state. In the second study tracks the structural and environmental changes of a small peptide as it transitions from a soluble, disordered state through two membrane-bound, structurally ordered states. I was then able to apply the findings of these experiments to

study intramembrane proteolysis, wherein I describe substrate characteristics and their interactions with proteases.