Tanner Robison: Chemical & Biological Engineering
Mentor: Jovanka Voyich -- Microbiology & Immunology
Identifying specific extracellular residues of the sensory kinase SaeS important in the recognition and response to hydrogen peroxide in Staphylococcus aureus.

The Staphylococcus aureus (S. aureus) exoprotein secretion system (SaeR/S) is a two-component protein system within Staphylococcus aureus that has been linked to this pathogen's ability to survive within human neutrophils (polymorphonuclear leukocytes or PMNs). Prior studies have shown that an extracellular (EC) loop, consisting of nine amino acid residues on SaeS, is vital for S. aureus to sense and respond to extracellular stimuli--specifically components of human PMNs. Additionally, γ-hemolysin (hlgA) is a predominant virulence factor that targets immune and red blood cells. This toxin has been shown to be regulated by SaeR/S. New hlgA-GFP S. aureus cell strains--including point mutations of the residues on the EC loop--have been developed in order to study the role of each residue in S. aureus survival. All strains contained a plasmid on which the hlgA gene was linked with the GFP reporter. The current study sought to analyze the activity of these strains in the presence of hydrogen peroxide, a predominant reactive oxygen species produced by neutrophils. GFP fluorescence following transcription of hlgA was measured using spectrophotometry. This method was used to investigate the expression of hlgA following S. aureus incubation (up-to 6 hours) with non-lethal to lethal doses of hydrogen peroxide. Experimental findings suggest that the hlgA-GFP reporter may not be sensitive enough to definitively show differences in hlgA expression in wild-type and in SaeS EC point mutation S. aureus strains following exposure to hydrogen peroxide. While high concentrations of hydrogen peroxide did negatively impact cellular growth early on, GFP concentrations were not significant enough at those time points to distinguish differences in