Photo-chemical activation of Toll-like Receptors for Designing Vaccine Responses

Awardee: Aaron Esser-Kahn
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Awardee Institution: University of California - Irvine

Our goal is to develop tools that allow researchers to design an immune response. Recent research into the immune system has revealed that foreign pathogens are detected through a series of receptors on antigen presenting cells. These receptors are synergistically activated by multiple pathogen associated molecular patterns. Materials scientists have a large role to play in the coordinated design of vaccines and synthetic activators of the immune system. We report on our development of chemical and polymeric tools for interacting with the immune system that allow us to control the spatial and temporal aspects of innate immune activation. Our methods involve the bio-conjugation of multiple different PAMPs to polymeric scaffolds and the photo-caging and un-caging of TLR agonists. These synergistic PAMP scaffolds have been tested against dendritic cells and we will report on the results. Additionally, we will report on our work coupling these synergistic combinations to cell-surface and other antigen rich environments.