Study and Elucidation of Immunomodulatory Properties of Supramolecular Hacky Sacks

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Understanding the immune system has been an endeavor of many challenges. While trying to understand the immune system, major contributions have been made to science. Immune system stimulators have become a key element in the development of new medical applications. Many of these stimulators are particle based but of these, virtually none to our knowledge have been developed using a single molecule. The major advantage of using a monomer to produce particles is the reliability of preparation, which in turn would make a cost-effective approach turning a particle into a clinical option. To this field we are introducing Supramolecular Hacky Sacks (SHS), a colloidal particle formed by a thermo-responsive system. Preliminary data shows that the thermo- and pH-responsive system has immunomodulatory activity. To further the advancement of these particles for biomedical applications we aim to understand the immunostimulatory properties of a library of SHS. This will be done by considering the structure-activity relationship of these particles based on its monomer to its immunological activity. Aim 1 is divided in 3 main parts. First part *(a)* Serving as *synthesis and characterization of 8-Aryl-2'-deoxyguanosine (8ArG) derivatives; (b) self-assembly and molecular modeling studies of 8ArG derive supramolecular guanine quadruplexes (SGQs)* and (*c) Study thermo- and pH-responsive properties of SGQs to form SHS*. SHS are formed from responsive Supramolecular Guanosine Quadruplexes. SGQs result from the self-assembly of guanine molecules into tetramers with the help of a cation (K^+). Once we have developed and characterized SHS and monomers we will explore how these generate any immunological activity (structure-activity relationship or SAR) in aim 2 as *SAR studies by using model compounds, 8ArG derivatives, and its SHS.* These studies will serve as an integral part of our long-term goal, to develop more sophisticated supramolecules for biomedical purposes.