Title:
Utilization of Genomic Approaches for Developing Immune and Alternative Therapeutic Interventions for Emerging and Re-emerging Infectious Diseases

Abstract:
There is an urgent need to develop improved vaccination techniques that provide effective and lasting protection against viral infection. It is thought that the induction of strong T cell responses and cross-neutralizing monoclonal antibodies (mAbs), as well as antibodies that drive ADCC, plays a key role in vaccine-induced protection. The development of vaccines against highly infectious pathogens such as Human Immunodeficiency Virus (HIV-1), Influence A virus (Flu), Dengue virus (DV), Chikungunya virus (CHIKV), Respiratory Syncytial Virus (RSV), Middle Eastern Respiratory Syndrome (MERS) and Zika virus (ZIKV) has been wrought with difficulties. Recent advances in human antibody isolation have uncovered broadly neutralizing antibodies (bNAbs) that are capable of preventing infection against a wide array of viral pathogens. Yet generating and delivering biologically-relevant levels of such antibodies using conventional methods is impractical, often requiring excessive expenses and repeated administrations. Creating new methods of delivering neutralizing mAbs that overcome these constraints could drastically tip the scales in the fight against a number of devastating viral pathogens.

In the current approach, we have constructed an optimized, enhanced DNA plasmid formulation capable of expressing a neutralizing antiviral IgG. A single administration of the IgG plasmid resulted in the generation of IgG molecules in mouse and capable of binding and neutralizing activity against viral target. Importantly, this delivery method resulted in a more immediate increase in antibody levels, lasted for months, and protected against viral challenge. This approach establishes a new platform for delivering protective mAbs safely and effectively. The study has implications for prophylactic and therapeutic strategies against viral infections and other important diseases, especially in resource-limited settings where antibody therapy is cost-prohibitive.