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DNA immunization to prime the high quality antigen-specific B cell responses – a powerful pathway to induce protective antibodies

It is well established in the history of vaccines that antibodies play a critical role in vaccination induced protections against a wide range of infectious pathogens. Different forms of vaccines were developed to improve the antibody responses in addition to other approaches to enhance the protective antibody responses such as the use of various potent adjuvants to amplify the immune responses or the development of specific delivery approaches that may improve the efficiency of vaccines. At the same time, there is limited progress in developing strategies that target at the B cell development which is the foundation of high quality antibody responses. In recent years, our studies have demonstrated that DNA immunization is a powerful approach to induce high levels of germinal center (GC) B cell development through the effect of enhanced Tfh cells. This finding is interesting as the original objective to develop the DNA vaccines was to elicit better T cell immune responses since DNA vaccines work through endogenous antigen processing and presentation. While DNA vaccine induced T cells (especially CD8+ T cells) may not be enough to provide protection by themselves, the helper T cells elicited by DNA immunization played a critical role for antigen specific B cell development. Furthermore, our work also demonstrated that DNA immunization can utilize innate immune response pathways, such as AIM2 and STING, to elicit potent antibody responses. Putting together, it is exciting to discover that DNA immunization can provide the unique benefits of combining both acquired and innate immune mechanisms to elicit high level and high quality antigen specific B cell responses, and our finding established the basis for the utility of DNA vaccines in a heterologous prime-boost vaccination design by combining with a protein based vaccine boost.

Biography

Shan Lu, MD, PhD, is a tenured professor in the Department of Medicine at the University of Massachusetts Medical School, USA. He is a pioneer in the discovery and applications of DNA immunization. He has developed world's first polyvalent DNA prime-protein boost HIV vaccine which demonstrated robust immunogenicity in healthy human volunteers. He has conducted novel vaccine research studies against a wide range of emerging and re-emerging pathogens. Dr. Lu was the past president and a current Executive Board member for the International Society for Vaccines (ISV). He is a current member of editorial boards for a number of leading scientific journals including Journal of Virology and Vaccine. He is the Deputy Editor-in-Chief for Emerging Microbe and Infections (EMI), published by Nature Publishing Group (NPG). Dr. Lu is a Fellow of American College of Physicians (FACP) and a Fellow of International Society for Vaccines (FISV).

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