Boosting Vaccine Efficacy via Controlling Nano-Bio Interactions

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Despite remarkable successes of immunization in protecting public health, safer and more effective vaccines against a number of life-threatening pathogens such as HIV, ebola, influenza, and SARS-CoV-2 remain urgently needed.[1] In this talk, I will present my group recent work on engineering nanoparticles for vaccine delivery.[1-3] In particular, we found that the size, surface property and type of nanoparticles (polymer or lipid) dictate their interactions with immune cells.[2,3] We also developed a simple, scalable and reproducible method to functionalize hemagglutinin (HA) immunogens on the surface of nanoparticles via stable metal chelation chemistry.[1] The resulting HA-functionalized nanoparticles display enhanced antigen deposition into germinal centers within the draining lymph nodes (Figure 1), driving increased HA-specific B cell, and follicular helper T cell responses and ultimately, enhanced protection against highly pathogenic influenza virus.[1]

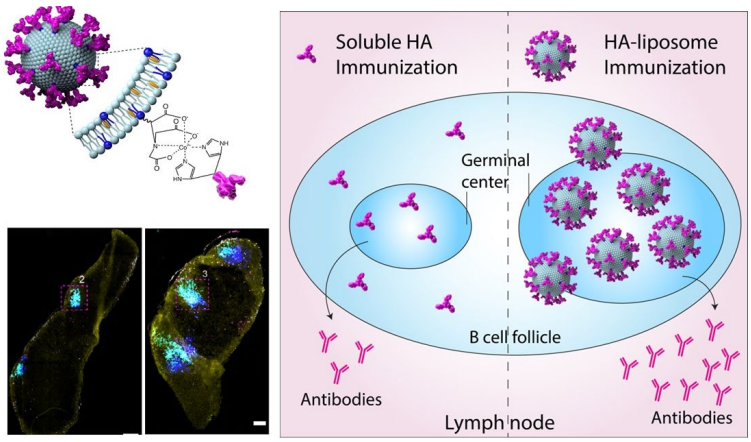

Figure 1: Engineering nanoparticle surface for enhancing antibodies production efficiency.

References

1. Vu, M. N.; Kelly, H. G.; Tan, H. X.; J.A., J.; R., E.; Davis, T. P.; **Truong, N. P.***; Wheatley, A. K.*; Kent, S.* J. Hemagglutinin Functionalized Liposomal Vaccines Enhance Germinal Center and Follicular Helper T Cell Immunity. *Adv. Health. Mater.* 2021, 10, 2002142

2. Khor, S. Y.; Vu, M. N.; Pilkington, E. H.; Johnston, A. P. R.; Whittaker, M. R.; Quinn, J. F.; **Truong, N. P.***; Davis, T. P.* Elucidating the Influences of Size, Surface Chemistry, and Dynamic Flow on Cellular Association of Nanoparticles Made by Polymerization-Induced Self-Assembly. *Small* 2018, 14 (34), 1801702

3. Vu, M. N.; Kelly, H. G.; Wheatley, A. K.; Peng, S.; Pilkington, E. H.; Veldhuis, N. A.; Davis, T. P.; Kent, S. J.; **Truong, N. P.*** Cellular Interactions of Liposomes and PISA Nanoparticles during Human Blood Flow in a Microvascular Network. *Small* 2020, 16 (33), 2002861