Vaccine engineering with mineral shell: A promising strategy to overcome preexisting immunity

With the support by the National Natural Science Foundation of China and the Ministry of Science and Technology of China, Prof. Tang Ruikang (**唐睿康**) from Zhejiang University, cooperated with Prof. Chen Ling from Guangzhou Institutes of Biomedicine and Health and Prof. Qin Chengfeng from Beijing Institute of Microbiology and Epidemiology, reported a biomimetic mineralization-based vaccine engineering strategy to circumvent the preexisting immunity, which was published in *Advanced Materials* (2016, 28: 694—700).

The recombinant viral vectors are being extensively developed as vaccines. However, the pre-existing anti-vector immunity considerably precludes their repetitive administrations through suppressing the transgene-specific immune response. Recent clinical data reveal that the dampening effect of preexisting Ad5-speci c immunity may be associated with the failures of the Ad5based human immunodeficiency virus (HIV) vaccine trials. In order to address this issue, the recombinant adenovirus serotype 5 (rAd5) vector expressing simian immunodeficiency virus (SIV) envelope protein (rAd5-Env) was *in situ* biomineralized to obtain a vaccine-biomineral hybrid with core-shell structure. The versatility nature of mineral shell masked vaccine's surface and created "stealth" cover to evade the preexisting immunity but the shell could also spontaneously degrade under the intracellular condition, which ensured the original activities of vaccines. In both *in vitro* and *in vivo* experiments, the biomineralized Ad5 could lead to the enhancement of mono- and multifunctional cytokines-positive SIV-Env specific CD4+T cell and CD8+T cell responses, which could maximize the vaccine efficacy. This study demonstrates promising prospects of the virus-material hybrid, providing a translational strategy for the rational design of vaccines against infectious diseases.

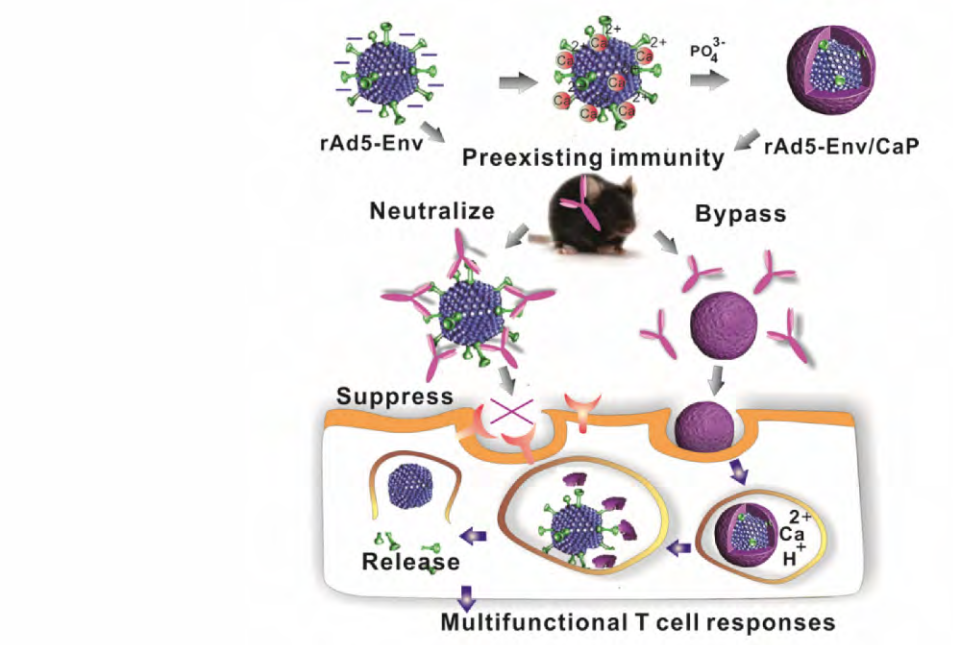

Figure Scheme illustrates the evasion of preexisting immunity using biomineralization strategy.