TRAP-cage - a novel synthetic vaccination platform

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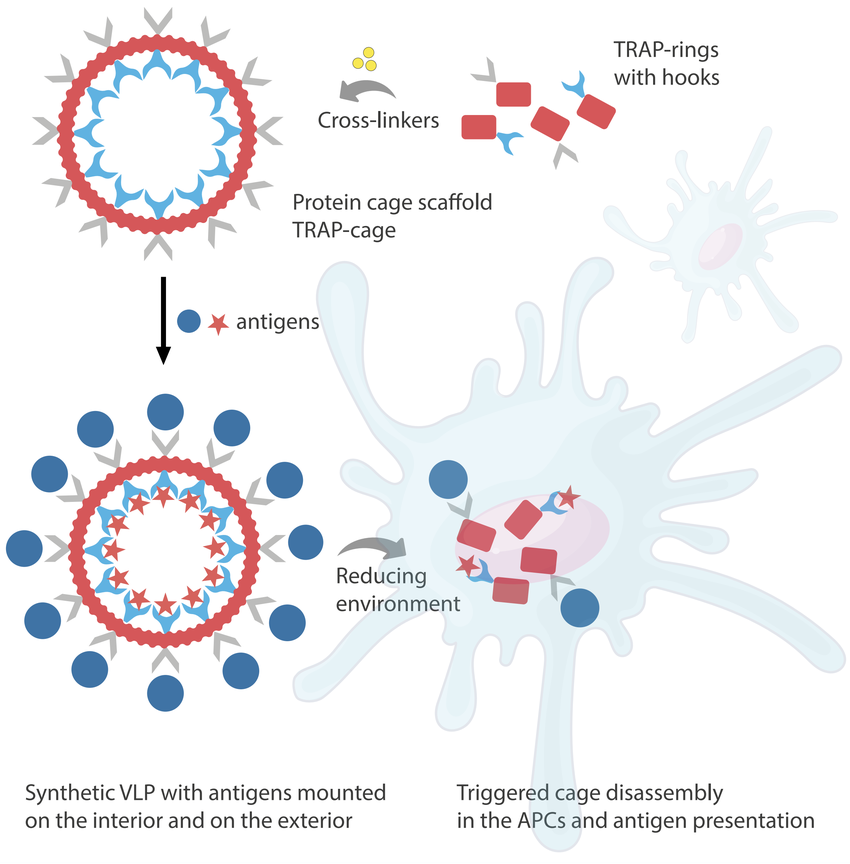
Protein cages are biological nano-assemblies which can act as nano-compartments and play vital roles in living systems. Taking inspiration from nature, non-infectious virus-like particles have been engineered and proven useful for various applications in biotechnology including as vaccines.

nCage Therapeutics have developed a non-viral, novel synthetic VLP constructed from a ring-shaped protein – trp-RNA binding attenuation protein (TRAP)[1]. Among many potential applications, we are exploring TRAP-cage as a vaccine platform. TRAP-cages are unique in being able to deliver internal cargo (such as peptides) to antigen presenting cells.

Our development strategy aims to test different viral antigens in combinations including influenza hemagglutinin (HA). We are currently designing an HA-based antigen tailored to our platform in terms of attachment and spacing so that we can achieve strong and durable immune response. Viral peptide delivery has potential to induce a balanced T an B cell response.

TRAP-cage assembly and antigen presentation



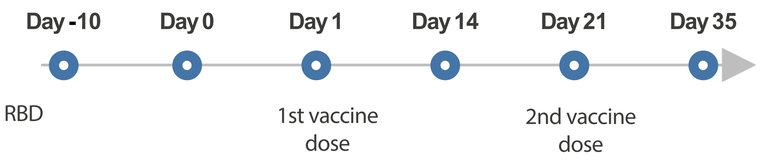
Synthetic VLP with antigens mounted on the interior and on the exterior

Triggered cage disassembly in the APCs and antigen presentation

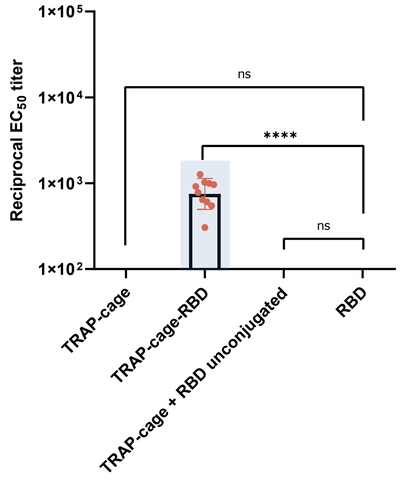
Vaccination with TRAP-cage decorated with SARS-CoV-2-RBD

10 mice PBS
10 mice TRAP-cage
10 mice TRAP-cage-RBD
10 mice RBD
10 mice TRAP-cage + unconjugated RBD

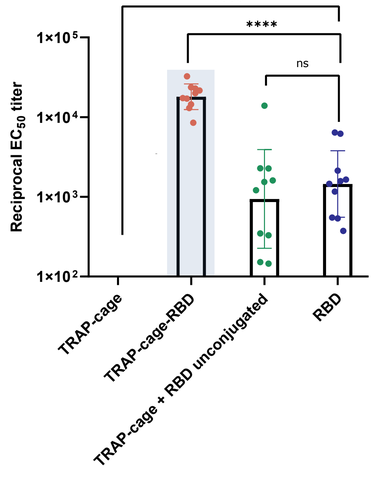
*all groups adjuvanted with Addavax



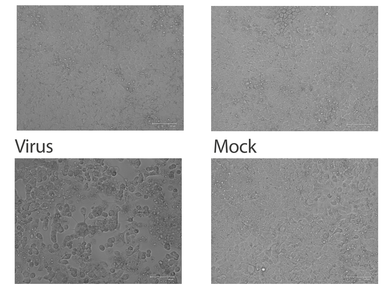
Antibody response after 1st dose



Antibody response after 2nd dose

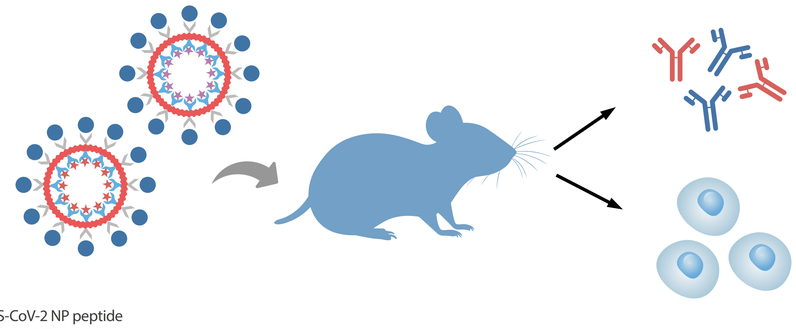


Neutralization of the live virus



>10x increase in antibody reponse from TRAP-cage platform

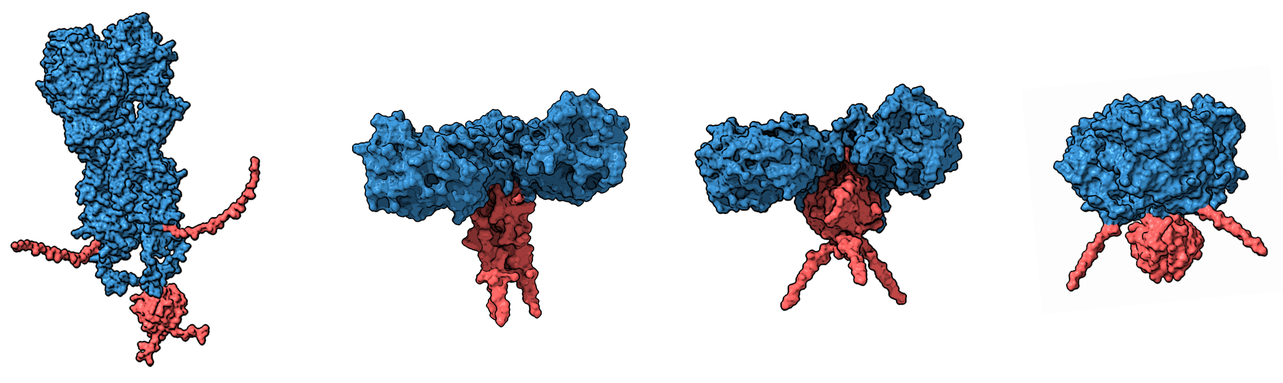
Study design: TRAP-cage-SARS-CoV-2-RBD loaded with viral peptides from SARS-CoV-2 and influenza



SARS-CoV-2 NP peptide
Influenza NP peptide
SARS-CoV-2 RBD

Aim: balanced T and B cell response

Design of HA influenza antigens for TRAP-cage decoration



HA-foldon | Rigid linker - HA-head | Foldon - HA-head | HA-head-foldon

[1] Malay A., et al. Nature, 2019

Conclusion

- VLPs produce best in class vaccines with a strong and durable immune response
- TRAP-cage can be used as a synthetic viral like particle (VLPs) mimicking the shape and structure of a virus
- nCage has demonstrated the potential of their vaccine platform in animal models showing a ten fold increase in efficacy versus soluble antigen

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