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Opportunity

To support funding of GMP manufacture and stage 1 clinical trial for the second-generation COVID-19 vaccine platform, contact:

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COVID-19 vaccine platform

Enables rapid production of second-generation vaccines against SARS-CoV-2 variants of concern

The Technology

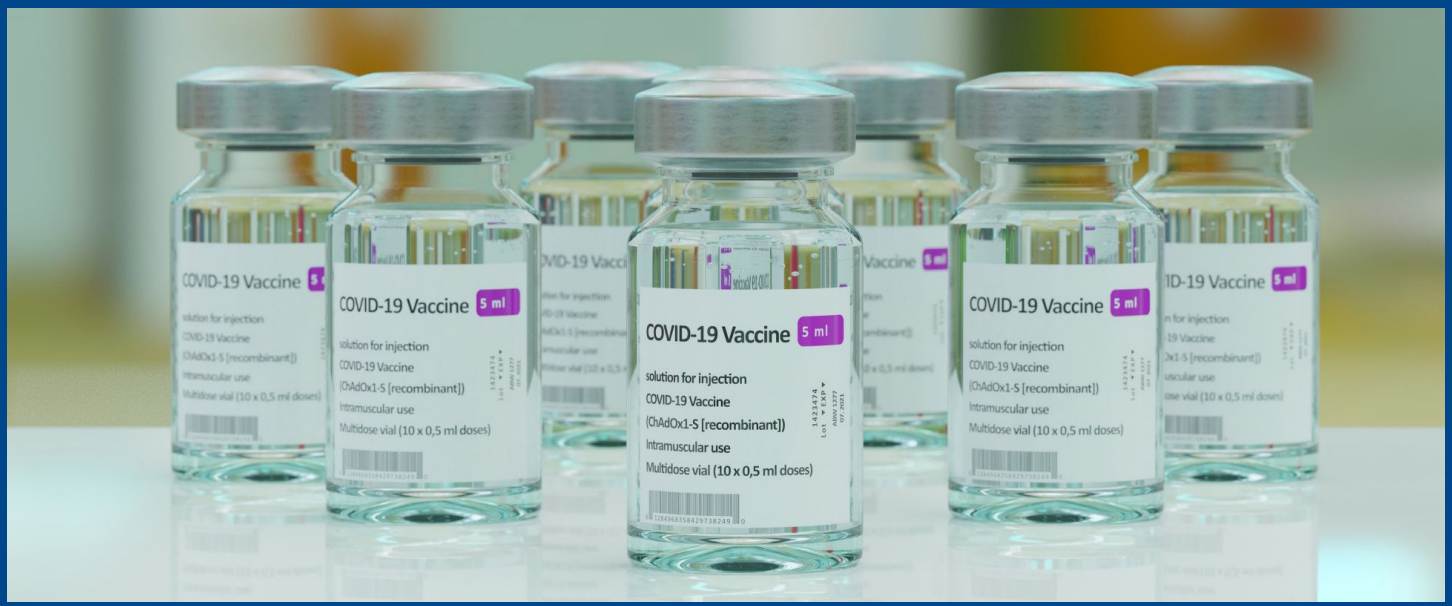
- Second-generation recombinant protein RBD SARS-CoV-2 vaccines that elicit immunity against SARS-CoV-2 variants of concern in previously vaccinated/infected individuals.

Market Need

- The emergence of SARS-CoV-2 variants of concern that harbour mutations in the RBD and efficiently escape the neutralising antibody response raised by first-generation vaccines or infection possesses high risks to the global ability to manage the pandemic.

Technology Status

- A highly immunogenic COVID-19 vaccine scaffold that targets the SARS-CoV-2 receptor binding domain (RBD) and enables rapid incorporation of antigens from existing and future variants of concern.



Market Need

Currently available 'first-generation' COVID-19 vaccines, including adenovirus-vectored, mRNA, and protein-subunit vaccines, use antigens based upon the SARS-CoV-2 full- length Spike (S) protein. These S protein vaccines are associated with relatively rare but serious adverse events including thrombocytopaenia with thrombosis syndrome (TSS) with the Astra Zeneca vaccine, and myocarditis with the S mRNA vaccines (Pfizer and Moderna).

Several SARS-CoV-2 variants of concern have emerged that harbour mutations in the receptor-binding domain and efficiently escape the neutralising antibody response raised by the first-generation vaccines or infection. Second- generation COVID-19 vaccine candidates are required to elicit robust protective immunity against these SARS-CoV-2 variants of concern.

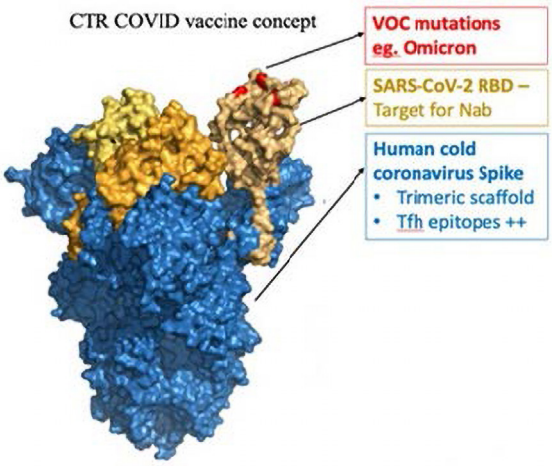


Figure 1. Chimeric trimeric RBD (CTR) vaccine platform, indicating the SARS-CoV-2 RBD (yellow), VOC mutations (red) (derived for example, from Omicron) and HKU1 spike trimer scaffold (blue).

Solution

Prof Stephen Kent and Dr Adam Wheatley at the Doherty Institute for Infection and Immunity and collaborators have developed an RBD-based SARS-CoV-2 vaccine platform that can be used to generate COVID-19 vaccines targeting mutations in emerging SARS-CoV-2 variants that evade the immune responses produced by the current COVID-19 vaccines.

Vaccine approaches that use just the receptor-binding domain (RBD) region of the S protein as an antigen offer potential advantages of focusing immunity to the key protective determinants. As an immunogen, the RBD shares multiple positive attributes with the full-length S protein, as well as potential production and manufacturing advantages such as delivery of abundant, temperature-stable vaccine doses at an affordable cost. However, the RBD must be presented in an appropriate scaffold to induce high level immunity. Prof Kent and Dr Wheatley have designed appropriate scaffolds to enhance and focus the most effective immunity against COVID-19. This technology was awarded $3m of government (MRFF) funding.

Technology and IP Status

Data generated to date demonstrate that the vaccine platform:

- can be efficiently expressed in a mammalian cell line system;
- presents the SARS-CoV-2 RBD in an antigenically conserved, trimeric conformation;
- is compatible in formulation with all adjuvant systems evaluated to date;
- is safe and displays robust antibody and T cell immunogenicity in mice and non-human primates;
- elicits potent neutralising activity against live SARS-CoV-2 virus across multiple preclinical animal models that exceeds average responses in humans who have recovered from COVID-19;
- protects mice against robust respiratory challenge with a highly relevant SARS-CoV-2 variants;
- The CTR platform with OmiBA.2 variant has been expressed using the Lonza cell line system and is currently being evaluated in mice.

Tech name and number	2021-022 Chimeric trimeric RBD (CTR) COVID vaccine
Researchers	Prof Stephen Kent, Dr Adam Wheatley
Publications	Tan et al. Immunogenicity of prime-boost protein subunit vaccine strategies against SARS-CoV-2 in mice and macaques. Nature Communications 2021. DOI: 10.1038/s41467-021-21665-8
Patents	PCT application PCT/AU2021/903377 filed on 23 March 2022
Keywords	COVID-19 vaccine, SARS-CoV-2, RBD, stage 1 clinical trials

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