‘AbBind’: A Novel Virus-like Particle Platform For Vaccine Antigen Delivery

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INTRODUCTION

Virus-like particles (VLPs) have been used for several decades as scaffolds for the display of vaccine antigens. This has proven to be a an effective strategy- selected antigens derived from diverse pathogens have been incorporated into VLPs and used as candidate vaccines against influenza, malaria, tuberculosis and other infectious diseases. A **common approach to fuse antigen is genetic fusion**, where the antigen is joined to the capsid protein as a single polypeptide. This method is unreliable, however, **arising from inaccuracies in predicting the consequences of protein engineering**. **This invention** relates to a specific method for attachment of any combination of antigens to a modified **VLP without any further modification of the scaffold**. The scaffold consists of the Hepatitis B core particle (HBc) which has been modified to incorporate an antibody-binding protein at its surface. It will therefore **bind any protein containing an antibody Fc fragment**. A separate avenue of investigation in vaccinology relates to the use of monoclonal antibodies against surface receptors common to immune cells for **receptor-mediated uptake** of antigen-antibody complex. The complex can be delivered effectively to a specific subset of immune cells of interest.

AbBind

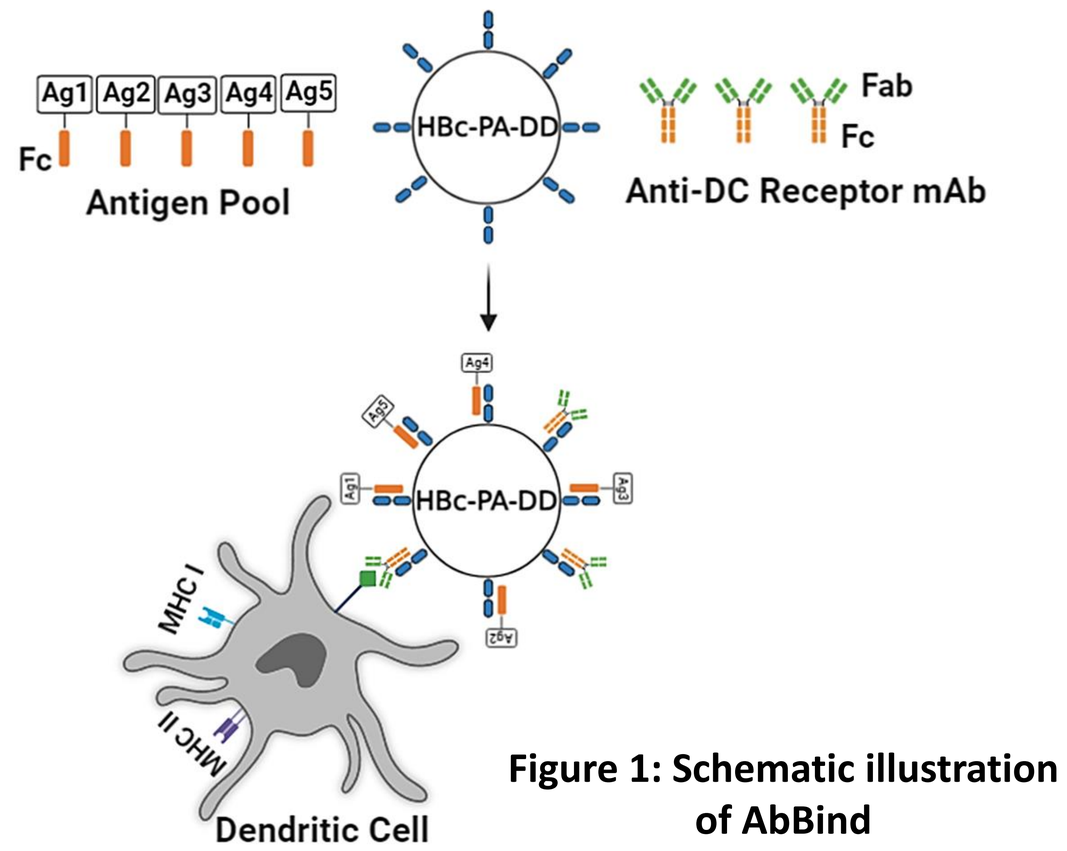

Figure 1: Schematic illustration of AbBind

RESULTS

- Highly Versatile: Multiple antigens and IgG antibodies can be bound in any proportion without genetic engineering.
- Efficient VLP capsid formation and high binding affinity for Fc-fusion proteins.
- Fc fusion facilitates purification, using Protein A column which are in widespread industry use.
- HBc-PA-DD VLP complex induces high proliferation and activation of OVA specific CD4+ and CD8+ T cells *in vivo.*
- HBc-PA-DD VLP complex induces high expression of antibodies such as IgG, IgG1 and IgG2a against the SARS-CoV2 S1 spike antigen.
- This novel VLP technology can be applied to therapeutic cancer vaccines and vaccines against viruses, bacteria, parasites or fungi.
- This novel VLP technology can be applied in design of multivalent vaccines.

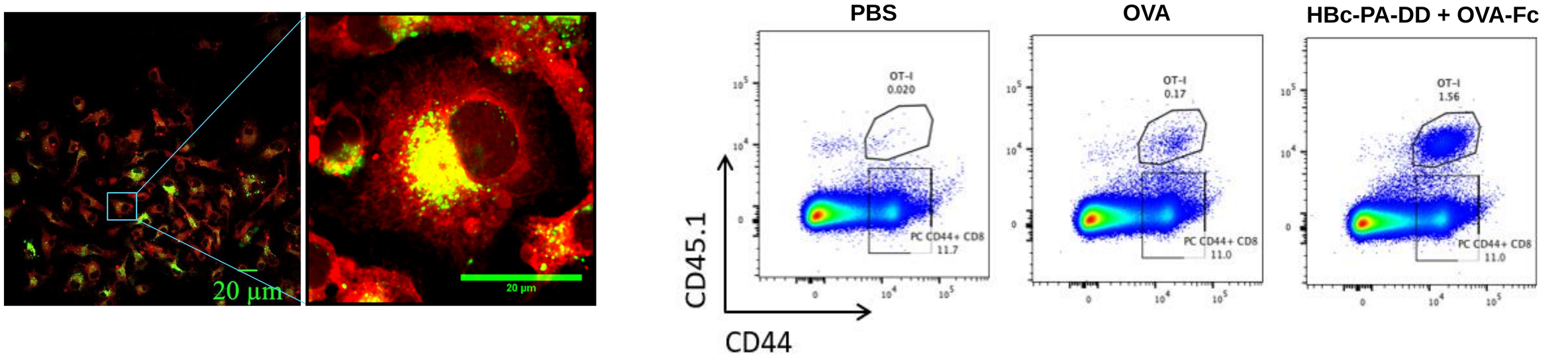

Figure 2: Confocal microscope imaging of HBc-PA-DD VLP internalization by BMDCs, and Enhanced proliferation and activation of OVA specific CD8+ T cells *in vivo* by HBc-PA-DD VLP complex

CONCLUSION

We have established a flexible and efficient platform for conjugating epitopes, whole native protein domains, and targeting antibodies to the novel VLP system. This platform could be valuable for vaccine development against infectious diseases and cancer. It could be used in various other broader applications such as targeted delivery of drug or as an imaging agent of tumour cells etc. Fc-fusion proteins and antibodies are extensively studied and produced in industries for various applications. Therefore we believe the designed platform will provide simple, rapid and efficient ways to overcome the issues of vaccine development.

ACKNOWLEDGEMENT

I would like to thank Prof Jeremy Derrick, past and current members of JPD Lab, Andrew MacDonald’s Lab, Kathryn Else’s Lab and my funders for making this project work successful.

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