Research & Innovation Services (RIS)

UNIVERSITY OF BATH

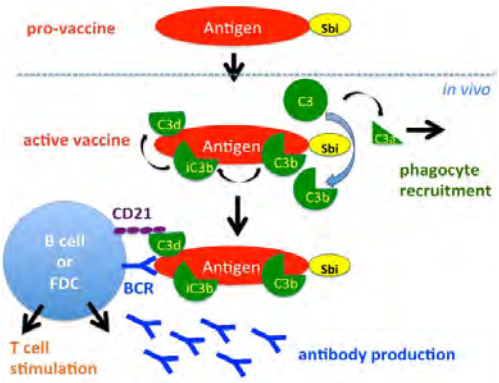
NOVEL VACCINE ADJUVANT

Platform technology with application for vaccines against infectious disease

TECHNOLOGY

Researchers at the University of Bath have developed a platform technology for the generation of novel conjugate vaccines based on a unique microbial immune evasion protein. The protein is a small, excreted protein factor expressed by a human pathogenic bacteria that modulates complement-mediated defense mechanisms against the microorganism.

Compared to all known immune evasion proteins, this particular protein is unique. The protein has a number of domains, where several of them bind to the central complement component C3 causing fluid phase consumption of C3. However, if activation of C3 occurs close to an antigen, it results in the covalent attachment of the initial activation product, C3b, to that antigen.



The interaction between antigen-bound C3d (the final degradation product of C3b) and complement receptor 2 (CR2/CD21) on B cells, results in an enhanced antibody response. When an antigen becomes opsonised by C3d (or intermediate products iC3b and C3d) the antigen moiety can bind to the B cell antigen receptor complex, while the C3d moiety simultaneously binds to the CR2 receptor complex on the same cell. This co-ligation of receptors has a profound molecular adjuvant effect, lowering the threshold of antigen required for B cell activation by 10,000 fold.

The ability of our novel protein to activate C3 as part of a vaccine conjugate results in the covalent attachment of activation product C3b to hydroxyl groups on the antigen surface and subsequently, degradation products of C3b act as potent adjuvants.

Sbi protein domain

Antigen-Sbi conjugate

C3b antigen attachment

Antigen opsonized

Binds BCR and CD21

Activates B cells

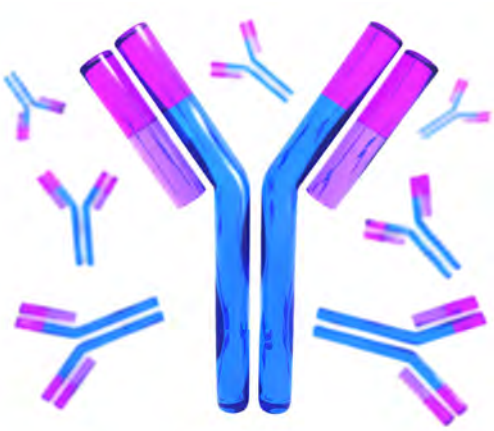
Increases antibody production

Lowers activation threshold

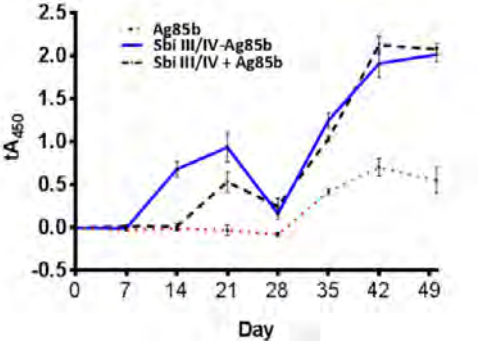
Potent adjuvant

BENEFITS

- Application against a range of antigens and pathogens
- Enhances the immune response four-fold by activating C3 at the vaccination site
- Stimulates B & T-cell adaptive immune response
- Stimulates the innate immune system
- Boosts antibody production
- Lowers the threshold of antigen required for B cell activation by 10,000 fold



APPLICATIONS



- Proof of concept using Mycobacterium tuberculosis antigen 85b
- Mice were immunized with either Sbi-Ag85b fusion, Sbi + Ag85b mixture (not fused) or Ag85b alone
- Administration of a Sbi-Ag85b fusion and co-immunization of Sbi + Ag85b during vaccination leads to an enhanced antibody response *in vivo*

FURTHER INFORMATION

- Recent data exemplifying the technology has been published in Frontiers in Immunology. Yang et al 2019. Frontiers in Immunology, Volume 9, Article 3139
- The technology is protected by PCT application (PCT/EP2017/080321) and is available for licensing on a non-exclusive or field-exclusive basis
- The research outlined has been developed by Professor Jean van den Elsen and Dr Andrew Watts from the University of Bath
- Both researchers have experience in patenting technologies and in commercialisation of novel technologies

CONTACT

The University of Bath is looking for partnerships to help develop this technology for a variety of sectors. If you are interested to discover more then please get in contact.

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