Chariot Innovations

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ECRA vaccines for Blue Tongue Virus

Summary

Blue Tongue Virus (BTV) affects sheep, cattle, deer, goats and camelids with mortality rate of 30-70% upon infection. The virus has caused outbreaks throughout the world in the past and has been a massive burden on sheep stock for farmers.

Live-attenuated and inactivated virus vaccines are used to combat BTV. However, these vaccines are costly to produce, do not target every strain of virus and carry risks in safety & transport. A replication-deficient form of the virus has been developed as a vaccine which provide great advancement in the treatment and control of BTV.

Applications

- A vaccine for Blue Tongue Virus.

Benefits

- Safe- ECRA vaccines cannot revert to virulence.
- Established vaccine system in sheep.
- Lower production and transport costs.
- Complete serotype coverage – Vaccine can be applied as cocktail to target different serotypes.

Background

BTV is vectored by biting midges with common outbreaks occurring in mild climates such as Africa, Middle East, Asia and Oceania. However, there is increasing prevalence of BTV in colder climates (e.g. Northern Europe) due to climate-change induced expansion of mild habitats. In order to control the disease, vaccination with a polyvalent live-attenuated vaccine (LAV) is used but this is considered to be unsafe due to the possibility of virulent revertants and the potential of reassortment between LAV and wild-type BTV strains. Furthermore, LAVs lack complete serotype coverage and because LAVs are infectious they require a higher biosafety level of production and transportation, therefore are costly.

The Roy group have developed a novel form of BTV vaccine using **E**ntry **C**ompetent **R**eplication **A**bortive (ECRA) viruses. These viruses are deficient in the viral replication machinery allowing them to enter host cells but without replicating and spreading in animals. Instead, ECRA viruses will enter cells and only go a single round of viral mRNA synthesis consequently leading to an immune response.

Technology and its advantages

The genome of BTV is composed of 10 double stranded RNA (dsRNA) segments, with dsRNA S9 responsible for encoding the virus replication protein (VP6). In order to create ECRA vaccines, dsRNA segments with disruptive S9 RNA (VP6 deficient) are transfected into a complementary cell line that already expresses VP6 in *trans.* This way ECRA viruses can only amplify in the complementary cell line but not in any native host cell.

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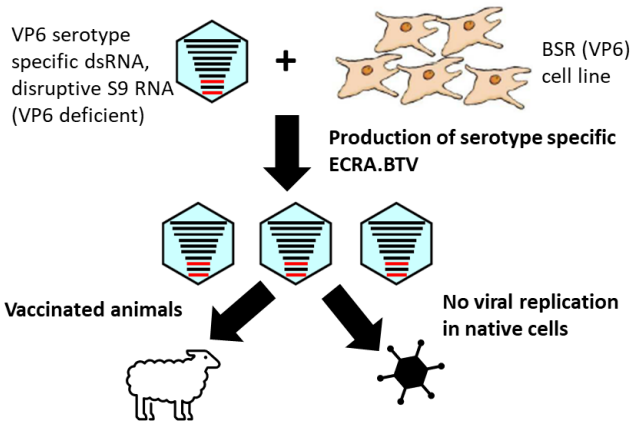

The nature of ECRA vaccines serve great advantage over the current form of LAVs in that:

- ECRA vaccines are safe as they cannot replicate independently.
- Lower production costs and they require lower biosafety level of production.
- Cocktail administration to target different serotypes.
- No adjuvant required, therefore less side effects compared to inactivated virus vaccines.
- Efficacious and safe to use in animals (no reported adverse effects and raised immunity against BTV).

Team

Prof. Polly Roy MSc PhD FMedSci OBE - the lead inventor of this technology. She is currently a Professor of Virology in the Department of Pathogen Molecular Biology at LSHTM. For the last three decades, the predominant subject of Roy's work, although not exclusively, has been BTV and African Horse Sickness Virus (AHSV). Roy has made significant contributions to understanding the basic molecular and cell biology, atomic structure, mechanisms of virus entry, genome synthesis, RNA packaging, capsid assembly, egress and cell-to cell transmission of these viruses.
Dr. Mark Boyce PhD - Research associate at the university of Oxford where he is currently investigating the structure and mechanisms of viral proteins to better understand viral assembly and evolution.

Intellectual Property

The technology is protected by a portfolio of patents PCT/GB2008/003945.