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Internship: A bivalent vaccine to reduce the risk of Nipah virus outbreaks

Supervisor: Prof Simon Graham
Research group: Porcine Reproductive and Respiratory Syndrome (PRRS) Immunology

About The Pirbright Institute

The Pirbright Institute delivers world-leading research to understand, predict, detect and respond to viral disease outbreaks. We study viruses of livestock that are endemic and exotic to the UK, including zoonotic viruses, by using the most advanced tools and technologies to understand host-pathogen interactions in animals and arthropod vectors. Our Institute is made up of a dynamic and vibrant community of employees covering a diverse set of chosen fields, backgrounds and experience. Our outlook is always balanced by our strong sense of purpose, values and behaviours, and an unwavering commitment to a 'one Institute' approach.

Project Summary:

Pig-to-human transmission was responsible for the most severe Nipah virus (NiV) outbreak, which was controlled by culling almost half the Malaysian pig population. Despite the threat NiV poses, no vaccines are available. Commercial development of NiV vaccines is limited since companies fear limited marketability due to the sporadic nature of outbreaks. To address this gap, we are developing a bivalent vaccine for pigs.

Live attenuated pseudorabies virus (PrV) vaccines are highly effective vaccines that can be engineered to express antigens from other pathogens. We constructed a PrV vaccine that produced both the NiV F and G glycoproteins in a soluble form. The NiV-neutralising antibody response stimulated by prime-boost vaccination was comparable to those seen with protective vaccine candidates. The inclusion of the NiV proteins into the PrV vaccine did not hinder PrV-specific immune responses. Overall, the data suggested that the bivalent PrV-NiV vaccine candidate would likely provide protection against both viruses. However, the immune responses suggest that two doses may be require.

We now aim to improve the vaccine so that it may provide protection after a single immunisation. We shall do this by engineering the NiV glycoproteins so that they are expressed on the surface of cells, which should enhance antibody responses. We will compare the new and original vaccine to determine whether we have improved immunogenicity. The best candidate will then be tested for its ability to protect pigs against both PrV and NiV. Current PrV vaccines need to be kept refrigerated, which can be challenging in the tropical region at risk from NiV. Therefore, we will evaluate stabilising the vaccine by fine coating it with silica. Since NiV infection restricts the ability of countries to trade pigs or pig products, it is essential that any NiV vaccine has a companion test that enable the discrimination of infected from vaccinated pigs. We have established a lab-based assay that allows such discrimination and will translate this to a rapid 'penside' test.

Further Details:

The intern will join the project team at Pirbright and work alongside a post-doctoral scientist. The intern will be involved in two vaccine studies, the first will determine whether PrV expressing membrane-bound NiV glycoproteins is more immunogenic than the vector expressing soluble NiV glycoproteins, and the second will determine whether the most immunogenic PrV-NiV vaccine candidate provides protection against pseudorabies that is comparable to the gold standard PrV Bartha K61 vaccine. The intern will additionally provide some support to activities relating to the development of a companion DIVA lateral flow test and the evaluation of the stabilisation of the PrV-NiV vaccine by ensilication.

The intern will be trained in a range of immunological and virological techniques and gain experience of participating in vivo studies and working in a high biocontainment environment. They will also gain valuable experience of working as part of a larger international translational research project team involving academic and commercial partners (FLI-Germany, Global Access Diagnostics, EnsiliTech and BioVacc Consulting). The intern will be embedded in PRRS Immunology group and will be provided with additional support by other students and staff members.

References for Suggested Reading:

- Vaccine development for Nipah virus infection in pigs - Frontiers | Vaccine Development for Nipah Virus Infection in Pigs (frontiersin.org)

- The pig as an amplifying host for new and emerging zoonotic viruses - The pig as an amplifying host for new and emerging zoonotic viruses - ScienceDirect
- Bovine herpesvirus-4-vectored delivery of Nipah virus glycoproteins enhances T cell immunogenicity in pigs - Vaccines | Free Full-Text | Bovine Herpesvirus-4-Vectored Delivery of Nipah Virus Glycoproteins Enhances T Cell Immunogenicity in Pigs (mdpi.com)

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See How to apply for details. Closing date to apply: 25.03.24