UK Health Security Agency

Case Study
VDEC rapidly develops an immunoassay for Mpox during the 2022 global outbreak

Mpox & VDEC

To better understand Mpox and its spread within the UK, VDEC developed an immunoassay to assess immune responses to Mpox infection and new vaccines.

Executive summary

The Vaccine Development and Evaluation Centre (www.gov.uk/guidance/ukhsas-vaccine-development-and-evaluation-centre-vdec) (VDEC) facilitates the development and evaluation of new vaccines and therapeutics.

VDEC developed an immunoassay at speed during the 2022 global Mpox outbreak that was used to assess serological markers in individuals that have received the Smallpox vaccine and individuals infected with Mpox (formerly known as Monkey pox).

Target

In 2022, there was a sudden and unexpected number of Mpox cases in individuals with travel history unrelated to Mpox-endemic regions. The outbreak spread globally and was declared a public health emergency of international concern by the World Health Organisation. This outbreak caused a need for understanding the transmission of Mpox and how best to deploy public health counter measures, such as Smallpox vaccination (Bavarian Nordic “IMVANEX”).

Aims

To develop our understanding of Mpox and its spread within the UK, we began developing a range of immunoassays for assessing immune responses to both Mpox infection and also in response to Smallpox vaccination, as well as the discrimination between these as part of funding obtained through CEPI (cepi.net/cepi-uk-mhra-and-uk-health-security-agency-advance-key-tools-monkeypox-vaccine-research). These assays could then be used to assess new, next-generation Mpox-specific vaccines, conduct research on Mpox immunity, and guide serosurveillance strategies to determine the spread of the virus.

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Issues

Limited research was previously conducted on Mpox immunology and its comparison to Smallpox vaccination. Furthermore, immunoassay development was confounded by similarity between Orthopoxviruses (the Family of Pox viruses including Mpox) and each virus containing over 200 different proteins that could be used in immunoassays.

Options

We safely screened a number of Monkeypox Virus (MPXV) and Vaccinia Virus (VACV) recombinant antigens against serum samples from diverse panels of infected and vaccinated individuals with the aim of identifying antigens or combinations of antigens that would allow us to accurately assess new vaccine candidates, evidence of Mpox-infection, and to discriminate between Mpox-infected and Smallpox vaccinated individuals.

VDEC's unique advantage

As VDEC is part of the Coalition for Epidemic Preparedness Innovations (CEPI) Centralised Laboratory Network (cepi.net/enabling-science), we were able to benefit from

cross-collaborative work within the lab network and the specialist skills of CEPI

to develop the assay and perform the clinical testing in-house.

Throughout this time, the collaboration with the UKHSA's Rare and Imported Pathogens Laboratory (www.gov.uk/government/collections/rare-and-imported-pathogens-laboratory-ripl) (RIPL) also based at Porton Down, enabled us to

benefit from safe and secure access to clinical expertise and samples.

We also worked with partners in the Clinical and Public Health Division to support with the establishment of a serosurveillance study to determine if Mpox had been spreading prior to the identified outbreak and determine estimated infection numbers. These were prime examples of

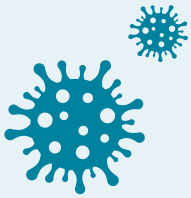
inter-agency collaboration in response to an emerging epidemic,

using the combined expertise of scientists, clinicians, and epidemiologists across VDEC and other divisions.

Future work

Since the beginning of the 2022 Mpox outbreak, the Emerging Pathogen Serology group has begun a number of collaborations with universities and research centres both within the UK and world wide as means to further understand Mpox immunity and the spread of the virus. The group (in partnership with the University of Birmingham) were recently awarded an Medical Research Council (MRC) grant to pursue development of an Mpox-specific antibody lateral flow device, to enable in-field assessment of an individual's immune response. The work carried out here has been published[1].

Details and priorities



The Emerging Pathogen Serology team at Porton Down focusses on

the development of immunoassays to support in the characterisation of emerging pathogens.

These assays can be used for discovery immunology, assessment of new vaccine candidates and for national serosurveillance.

Outcome

The Emerging Pathogen Serology team has developed a comprehensive suite of immunoassays for assessing and discriminating immune between Mpox-infected and Smallpox-vaccinated. We have since established our immunoassays as the primary assays for a number of different research studies across the UK and globally with partners in universities such as University of Birmingham, University of Oxford, and the University of Liverpool, with further funding obtained from MRC to

develop new Mpox diagnostics and vaccine candidates.

Work with VDEC

We work with industry, academia and government. Contact UKHSA today to see how we can help you.

Get in touch: **vdec@ukhsa.gov.uk**

1. Ashley D. Otter, Scott Jones, Bethany Hicks, Daniel Bailey, Helen Callaby, Catherine Houlihan, Tommy Rampling, Nicola Claire Gordon, Hannah Selman, Panayampalli S. Satheshkumar, Michael Townsend, Ravi Mehta, Marcus Pond, Rachel Jones, Deborah Wright, Clarissa Oeser, Simon Tonge, Ezra Linley, Georgia Hemingway, Tom Coleman, Sebastian Milward, Aaron Lloyd, Inger Damon, Tim Brooks, Richard Vipond, Cathy Rowe and Bassam Hallis. "Monkeypox Virus-Infected Individuals Mount Comparable Humoral Immune Responses as Smallpox-Vaccinated Individuals." (2023) Nature Communications 14: 5948.