Discovery helps researchers better understand immune system

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Professor David Tscharke. Credit: Jamie Kidston, ANU

A team of researchers have answered one of the most long-standing questions about how the immune system fights viruses and the discovery could help improve vaccine design.

A team from The Australian National University (ANU) and Monash University found the immune system can recognise more proteins from

viruses and vaccines than previously thought.

"More than 80 per cent of the virus proteins can be recognised by the immune system and used to trigger an immune reaction by the body. This is much more than was expected", said senior author Professor David Tscharke from the John Curtin School of Medical Research at ANU.

"This work has unearthed a better understanding of how well viruses and vaccines are recognised by the body."

Lead author Dr. Nathan Croft, from the Monash Biomedicine Discovery Institute (BDI), said the findings will have practical outcomes for new vaccines.

"We can now begin to apply this knowledge to other viruses and to cancer, to pinpoint favourable targets for the immune system," said Dr. Croft.

The team used vaccinia virus to understand how much of a virus is actually recognised and targeted by the immune system.

Vaccinia virus was used as a vaccine to eradicate smallpox and is now repurposed as a tool against other viruses as well as cancers.

"This is a remarkable finding that highlights the power of mass spectrometry to identify the entirety of viral antigens that are exposed to the immune system," said co-senior author, Professor Anthony Purcell from Monash BDI.

"The translation to human infectious disease is obvious, but the identification of tumor derived antigens is also an exciting area we are developing to drive the precision oncology field and cancer

immunotherapy."

"Our results also show that no part of the virus is hidden from the immune system, no matter what time these parts are produced or how they are used by the virus," said Professor Tscharke.

The team used a combination of biochemistry, bioinformatics and statistics to identify viral peptides present on the surface of infected cells and analyse the ability of the immune system to see them as foreign targets.

The research, supported by the National Health and Medical Research Council (NHMRC) and the Australian Research Council (ARC) is published in the *Proceedings of the National Academy of Sciences* (*PNAS*).

More information: Nathan P. Croft et al. Most viral peptides displayed by class I MHC on infected cells are immunogenic, *Proceedings of the National Academy of Sciences* (2019). DOI: 10.1073/pnas.1815239116

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