Microarray patch delivery of un-adjuvanted influenza vaccine induces potent and broad-spectrum immune responses in a phase I clinical trial

Alexandra C. I. Depelsenaire  
*Vaxxas Pty Ltd, Australia*

Angus H. Forster  
*Vaxxas Pty Ltd, Australia*

Katey Witham  
*Vaxxas Pty Ltd, Australia*

Margaret Veitch  
*The University of Queensland Diamantina Institute, Australia*

James W. Wells  
*The University of Queensland Diamantina Institute, Australia*

Follow this and additional works at: [https://dc.engconfintl.org/vaccine_viii](https://dc.engconfintl.org/vaccine_viii)  
*See next page for additional authors*

**Recommended Citation**
Alexandra C. I. Depelsenaire, Angus H. Forster, Katey Witham, Margaret Veitch, James W. Wells, Christopher D. Anderson, Adam Wheatley, Melinda Pryor, Jason D. Lickliter, Barbara Francis, Steve Rockman, Jesse Bodle, Peter Treasure, Julian Hickling, and Germain J. P. Fernando, "Microarray patch delivery of un-adjuvanted influenza vaccine induces potent and broad-spectrum immune responses in a phase I clinical trial" in "Vaccine Technology VIII", Tarit Mukhopadhyay, Merck Research Laboratories, USA; Charles Lutsch, Sanofi Pasteur, France; Linda Hwee-Lin Lua, University of Queensland, Australia; Francesc Godia, Universitat Autònoma de Barcelona, Spain Eds, ECI Symposium Series, (2022).  
[https://dc.engconfintl.org/vaccine_viii/5](https://dc.engconfintl.org/vaccine_viii/5)
Authors
Alexandra C. I. Depelsenaire, Angus H. Forster, Katey Witham, Margaret Veitch, James W. Wells, Christopher D. Anderson, Adam Wheatley, Melinda Pryor, Jason D. Lickliter, Barbara Francis, Steve Rockman, Jesse Bodle, Peter Treasure, Julian Hickling, and Germain J. P. Fernando

This abstract is available at ECI Digital Archives: https://dc.engconfintl.org/vaccine_viii/5
MICROARRAY PATCH DELIVERY OF UN-ADJUVANTED INFLUENZA VACCINE INDUCES POTENT AND BROAD-SPECTRUM IMMUNE RESPONSES IN A PHASE I CLINICAL TRIAL

Alexandra C. I. Depelsenaire, Vaxxas Pty Ltd, Brisbane, QLD, Australia
sdepelsenaire@vaxxas.com

Angus H. Forster, Vaxxas Pty Ltd, Brisbane, QLD, Australia

Katey Witham, Vaxxas Pty Ltd, Brisbane, QLD, Australia

Margaret Veitch, The University of Queensland Diamantina Institute, Faculty of Medicine, The University of Queensland, TRI, Brisbane, QLD, Australia

James W. Wells, The University of Queensland Diamantina Institute, Faculty of Medicine, The University of Queensland, TRI, Brisbane, QLD, Australia

Christopher D. Anderson, Department of Clinical and Experimental Medicine, Linköping University, Sweden

Adam Wheatley, Department of Microbiology and Immunology, University of Melbourne, at The Peter Doherty Institute for Infection and Immunity, Melbourne, Victoria, Australia

Melinda Pryor, 360biolabs, Melbourne, VIC, Australia

Jason D. Lickliter, Nucleus Network Pt Ltd, Melbourne, VIC, Australia

Barbara Francis, Avance Clinical Pty Ltd, Thebarton, SA, Australia

Steve Rockman, Department of Microbiology and Immunology, University of Melbourne, at The Peter Doherty Institute for Infection and Immunity, Melbourne, Victoria, Australia

And at Seqirus Pty Ltd, Parkville, VIC, Australia

Jesse Bodle, Seqirus Pty Ltd, Parkville, VIC, Australia

Peter Treasure, Peter Treasure Statistical Services Ltd, Kings Lynn, UK

Julian Hickling, Working in Tandem Ltd, Cambridge, UK

Germain J. P. Fernando, Vaxxas Pty Ltd, Brisbane, QLD, Australia; and The University of Queensland, School of Chemistry & Molecular Biosciences, Faculty of Science, Brisbane, QLD, Australia

Key Words: Microneedle array, influenza, clinical trial, delivery device.

Microarray patches (MAPs) offer the possibility of improved vaccine thermostability and dose-sparing potential as well as the potential to be safer, more acceptable, easier to use and more cost-effective for the administration of vaccines than injection by needle and syringe. Here, we report a phase I trial (ACTRN12618000112268/U1111-1207-3550) using the Vaxxas high-density MAP (HD-MAP) to deliver a monovalent influenza vaccine to evaluate the safety, tolerability, and immunogenicity of lower doses of influenza vaccine delivered by MAPs. To the best of our knowledge, this is the first study determining dose reduction potential using MAPs in humans. Monovalent, split inactivated influenza virus vaccine containing A/Singapore/GP1908/2015 [H1N1] haemagglutinin (HA) was delivered by MAP into the volar forearm or upper arm, or given intramuscularly (IM) once. Participants (20 per group) received HD-MAPs delivering doses of 15, 10, 5, 2.5 or 0 µg of HA or an IM injection of quadrivalent influenza vaccine (QIV). In two subgroups, skin biopsies were taken on days 1 (pre-vaccination) and 4 for analysis of the cellular composition from the HD-MAP application sites. All laboratory investigators were blind to treatment and participant allocation. The primary objectives of the study were safety and tolerability. Secondary objectives included immunogenicity and dose de-escalation assessments of the influenza vaccine delivered by HD-MAP. Both objectives were assessed for up to 60 days post-vaccination. The vaccine coated onto HD-MAPs was antigenically stable when stored at 40°C for 12 months. HD-MAP vaccination was safe and well-tolerated, with mild to moderate responses. Local AEs were application-site reactions such as erythema. HD-MAP administration of 2.5 µg HA induced haemagglutination inhibition (HAI) and microneutralisation (MN) titres that were not significantly different to those induced by 15 µg HA injected IM. Additional exploratory immunoassays encompassing antibody-dependent cellular cytotoxicity, CD4+ T cell cytokine production, memory B cell activation, and recognition of non-vaccine strains indicated that overall, Vaxxas MAP delivery induced immune responses that were similar to, or higher than, those induced by IM injection of QIV. Study limitations included small group sizes and the use of monovalent influenza vaccine in HD-MAP groups. In conclusion, vaccination using the HD-MAP was safe and well-tolerated and resulted in immune responses that were similar to or significantly enhanced compared with IM injection. Using the HD-MAP, 1/6 of the standard dose induced HAI and MN titres like those induced by 15 µg HA injected IM.