

Vaccine

Protective immunity of plant-produced African horse sickness virus serotype 5 chimaeric virus-like particles (VLPs) and viral protein 2 (VP2) vaccines in IFNAR-/- mice

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<https://www.sciencedirect.com/science/article/pii/S0264410X22008489#>

Abstract

Next generation vaccines have the capability to contribute to and revolutionise the veterinary vaccine industry. African horse sickness (AHS) is caused by an arbovirus infection and is characterised by respiratory distress and/or cardiovascular failure and is lethal to horses. Mandatory annual vaccination in endemic areas curtails disease occurrence and severity. However, development of a next generation AHSV vaccine, which is both safe and efficacious, has been an objective globally for years. In this study, both AHSV serotype 5 chimaeric virus-like particles (VLPs) and soluble viral protein 2 (VP2) were successfully produced in *Nicotiana benthamiana* ΔXT/FT plants, partially purified and validated by gel electrophoresis, transmission electron microscopy and liquid chromatography-mass spectrometry (LC-MS/MS) based peptide sequencing before vaccine formulation. IFNAR-/- mice vaccinated with the adjuvanted VLPs or VP2 antigens in a 10 µg prime-boost regime resulted in high titres of antibodies confirmed by both serum neutralising tests (SNTs) and enzyme-linked immunosorbent assays (ELISA). Although previous studies reported high titres of antibodies in horses when vaccinated with plant-produced AHS homogenous VLPs, this is the first study demonstrating the protective efficacy of both AHSV serotype 5 chimaeric VLPs and soluble AHSV-5 VP2 as vaccine candidates. Complementary to this, coating ELISA plates with the soluble VP2 has the potential to underpin serotype-specific serological assays.