Design of a Multi-Glycoprotein mRNA Vaccine Against Mokola Virus: Targeting Immunity to Overcome Rabies Vaccine Resistance

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Mokola virus (MOKV), a genotype 3 lyssavirus in the family Rhabdoviridae, causes sporadic cases of encephalomyelitis in humans and animals across sub-Saharan Africa. Despite its close relation to rabies virus, current rabies vaccines and post-exposure prophylaxis fail to provide cross-protection against MOKV, leaving a critical gap in immunity. No specific vaccine currently exists for this neglected zoonotic pathogen. This study employed immunoinformatics approaches to design a novel mRNA vaccine targeting all five glycoproteins of MOKV. Viral sequences retrieved from NCBI were systematically screened for antigenicity, allergenicity, toxicity, B-cell epitopes, cytotoxic Tlymphocyte (CTL) epitopes, and helper Tlymphocyte (HTL) epitopes. Selected epitopes were linked to construct a multi-epitope mRNA vaccine, with additional co-translational residues incorporated for enhanced expression and stability. The final vaccine candidate has a molecular weight of 129.19 kDa and a theoretical pI of 8.58. Molecular docking analysis demonstrated stable interaction with TLR3 and other innate immune receptors, with limited deformability. Immunogenicity predictions indicated that the construct is non-allergenic and non-toxic, while possessing strong potential to elicit robust B-cell, CD4+ T-cell, and CD8+ T-cell immune responses. This mRNA vaccine candidate offers a promising strategy to overcome existing resistance to rabies vaccination and confer protective immunity against Mokola virus. The findings warrant further in vitro and in vivo validation for clinical development.