

Immunoinformatics Aided Multi-epitope Based Vaccine Design Against Crimean-Congo Virus

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ABSTRACT

Crimean-Congo virus belongs to the Bunyaviridae family. It causes viral hemorrhagic fever virus. It causes the Crimean-Congo virus disease in non-human primates and humans. With 100% fatality, the virus is considered extremely dangerous. In the present study, the entire genome of a total available of 58 complete genomes of the Crimean-Congo virus was assessed to extract information regarding the proteome. Reverse vaccinology techniques were employed to the proteins in the proteome and 2 antigenic proteins were identified. The two antigenic proteins were nucleocapsid protein and glycoprotein. VaxiJen v2.0 server was used to predict the antigenicity of these proteins. The antigenic proteins were screened for B cell epitopes using ABCpred server. Potential MHC 1 and MHC 2 epitopes were analyzed using NetMHC and NetMHC 2 servers. The screened epitopes were analyzed for allergenicity using Allgpred server and Toxicity of the peptides were analyzed using Toxinpred server. The screened peptides were further shortlist using SignalP 4.1 Server to analyse any potential signal peptide cleavage sites and TMHMM Server v. 2.0. was used to predict transmembrane helices. The shortlisted peptide candidate was then checked for their parameters using ProtParam tool in ExPASy server. Solubility was estimated using Solpro server. Three dimensional structure of peptide was designed using PEP-FOLD 2.0 server. The structure was validated using Molprobit server and was further refined to obtain high quality peptide structure. From the selected peptides, a chimeric vaccine was developed by linking the peptides with GPGPG linker to cholera toxin B subunit. The vaccine was modelled by I-Tasser and refined by Galaxy refine server and validated using Ramachandran plot. The properties of the chimeric vaccine were also analyzed. Reverse translation was carried out using JCAT tool for expression in *E.coli*.

Keywords: Crimean-Congo virus; Immunoinformatics; peptide; vaccine; epitope

