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Immunoinformatic Design and Evaluation of an Epitope-Based Tetravalent Vaccine against Human Hand, Foot, and Mouth Disease

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Abstract : Hand, foot, and mouth disease (HFMD) is a highly contagious viral infection affecting mostly infants and children. Although the Enterovirus A71 (EV71) is usually the major causative agent of HFMD, other enteroviruses such as coxsackievirus A16, A10, and A6 are also found in some of the recent outbreaks. The commercially available vaccines have demonstrated their effectiveness against only EV71 infection but no protection against other enteroviruses. To address the limitation of the monovalent EV71 vaccine, the present study thus designed a tetravalent vaccine against the four major enteroviruses causing HFMD and primarily evaluated the designed vaccine using an immunoinformatics approach. The immunogen was designed to contain the EV71 VP1 protein and multiple reported epitopes from all four distinct enteroviruses and thus designated a tetravalent vaccine. The 3D structure of the designed tetravalent vaccine was modeled, refined, and validated. Epitope screening showed the presence of B-cell, CTL, CD4 T cell, and IFN epitopes with vast application among the Asian population. Docking analysis confirmed the stable and strong binding interactions between the immunogen and immune receptor B-cell receptor (BCR). In silico cloning and immune simulation analyses guaranteed high efficiency and sufficient expression of the vaccine candidate in humans. Overall, the promising results obtained from the in-silico studies of the proposed tetravalent vaccine make it a potential candidate worth further experimental validation.

Keywords : enteroviruses, coxsackieviruses, hand foot and mouth disease, immunoinformatics, tetravalent vaccine
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