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Designing of Multi-Epitope Peptide Vaccines for Fasciolosis (Fasciola gigantica) using Immune Epitope and Analysis Resource (IEDB) Server

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Abstract : Fasciola species (Fasciola spp.) is caused fasciolosis in ruminants such as cattle, sheep, and buffalo. Fasciola gigantica (F.gigantica) commonly infects tropical regions. Fasciola hepatica (F.hepatica) in temperate regions. Liver fluke infection affects livestock economically, for example, reduced milk and meat production, weight loss, sterile animals. Currently, Triclabendazole is used to treat liver flukes. However, liver flukes have also been found to be resistant to drugs in countries. Therefore, vaccination is an attractive alternative to prevent liver fluke infection. Peptide vaccines are new vaccine technologies that mimic epitope antigens that trigger an immune response. An interesting antigen used in vaccine production is catepsin L, a family of proteins that play an important role in the life of the parasite in the host. This study aims to identify immunogenic regions of protein and construct a multi-epidetope vaccine using an immunoinformatic tool. Fasciola gigantica Cathepsin L1 (FgCatL1), Fasciola gigantica Cathepsin L1G (FgCatL1G), and Fasciola gigantica Cathepsin L1H (FgCatL1H) were predicted B-cell and Helper T lymphocytes (HTL) by Immune Epitope and Analysis Resource (IEDB) servers. Both B-cell and HTL epitopes aligned with cathepsin L of the host and Fasciola hepatica (F. hepatica). Epitope groups were selected from non-conserved regions and overlapping sequences with F. hepatica. All overlapping epitopes were linked with the GPGPG and KK linker. GPGPG linker was linked between B-cell epitope. KK linker was linked between HTL epitope and B-cell and HTL epitope. The antigenic scores of multi-epitope peptide vaccine was 0.7824. multi-epitope peptide vaccine was non-allergen, non-toxic, and good soluble. Multi-epitope peptide vaccine was predicted tertiary structure and refinement model by I-Tasser and GalaxyRefine server, respectively. The result of refine structure model was good quality that was generated by Ramachandran plot analysis. Discontinuous and linear B-cell epitopes were predicted by ElliPro server. Multi-epitope peptide vaccine model was two and seven of discontinuous and linear B-cell epitopes, respectively. Furthermore, multi-epitope peptide vaccine was docked with Toll-like receptor 2 (TLR-2). The lowest energy ranged from -901.3 kJ/mol. In summary, multi-epitope peptide vaccine was antigenicity and probably immune response. Therefore, multi-epitope peptide vaccine could be used to prevent F. gigantica infections in the future.

Keywords : fasciola gigantica, Immunoinformatic tools, multi-epitope, Vaccine
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