

Perancangan Vaksin Peptida Berbasis Epitop untuk Virus Classical Swine Fever dan African Swine Fever di Indonesia secara In Silico = Epitope Based Peptide Vaccine Design for African Swine Fever Virus and Hog Cholera Virus in Indonesia through In Silico Approach

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Abstrak

Pada Oktober 2019, Sumatera Utara kembali terpapar penyakit kolera babi (hog cholera atau classical swine fever) dan demam babi Afrika. Wabah penyakit ini telah menyebabkan kematian pada ternak babi hingga 29.223 ekor di 17 kabupaten/kota di Sumatera Utara. Sementara pada Februari 2020, Dinas Pertanian dan Ketahanan Pangan Provinsi Bali melaporkan sebanyak 1700 ekor babi milik warga mati disebabkan oleh penyakit ASF di 9 kabupaten/ kota. Penelitian ini dilakukan untuk merancang vaksin berbasis epitop secara in silico untuk mencegah infeksi virus ASF dan CSF pada babi. Vaksin dibuat berbasis epitop dari protein virus karena sangat imunogenik dalam menginduksi produksi antibodi, dan juga merupakan target utama untuk netralisasi antibodi selama infeksi CSFV dan ASFV. Sekuens protein diunduh dari NCBI dan dianalisis secara komputasi. Prediksi afinitas ikatan dilakukan dengan menggunakan IEDB Tepitool dan prediksi epitop untuk CTL dilakukan dengan menggunakan IEDB NetCTLpan. Struktur protein target dapat diunduh dari Protein Database (PDB) maupun secara homology modelling dan struktur ligan peptida nonamer dirancang dengan menggunakan ChemBioDraw Ultra 14.0 untuk kemudian dipreparasi melalui proses optimasi geometri dan minimasi energi. Ikatan antara molekul SLA dan peptida epitope kemudian dianalisis dengan cara molecular docking pada situs asam amino tertentu dengan menggunakan software MOE 2014.09, untuk menghitung energi ikatan dan memverifikasi daerah interaksi epitop dengan reseptor protein.

On October 2019, Hog Cholera and African Swine Fever outbreak has struck North Sumatera. As many 29.223 pigs has been killed in 17 districts/ cities in North Sumatera. Meanwhile since February 2020, Bali Agriculture and Food Security Agency reported that over 1700 pigs were killed by ASF in 9 districts/ cities. This study aimed to design epitope-based peptide vaccine in order to prevent further infection of ASFV and CSFV. An epitope-based vaccine is potent in establishing a strong antibody due to its strong immunogenicity, and it is also the main target for inducing neutralizing antibodies during CSFV and ASFV infection. Sequences of ASFV and CSFV protein were collected from NCBI and analyzed through computational method. Peptides binding affinities were predicted using IEDB Tepitool and NetCTLpan was used to predict the CTL epitopes. The 3D structures of the protein were obtained either downloading from the Protein Database and homology modelling, and the nonamer peptide structures were drew by using ChemBioDraw Ultra 14.0 and then prepared through geometry optimization and energy minimization. The epitopes were further tested for binding against the SLA molecules using molecular docking technique at any amino acid residues to calculate its binding energy and verify the binding cleft epitope interactions.