



Study of universal vaccine design equipped with computational science

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Research objective

mRNA vaccine opened a door for universal vaccine that canonical virus-based vaccine approach may not be achieved. However, it is prohibitively time-consuming and expensive to identify immunogenic epitopes from viral proteins by standard wet lab studies, and consequently AI has emerged as a valuable tool to predict these candidates in a vastly accelerated manner. Additionally, because computational analysis can include both human-infectious and non-human-infectious viruses in calculation, it is highly expected that the vaccine developed in this way would be effective approach to prepare for future pandemic.

In this project, the applicant will design a universal vaccine by using *in silico* vaccine design technology that is explained below. From the list of priority pathogens that the ministry of health, labour, and welfare, Japan, designates, influenza virus will be selected as the target pathogen of this project. After *in silico* design, the predicted epitopes will be validated by relevant immunological assays. Lastly, the immunogenic peptide regions that are taken for universal vaccine design will be identified.

in silico vaccine design technology

NEC Corporation (NEC) and NEC group have extensive experience in cutting edge AI-driven vaccine design technology, currently being deployed in a broadly protective betacoronavirus vaccine project, ongoing with CEPI.

For infectious disease vaccine, both T cell and B cell epitopes are important. Therefore, we have been developed proprietary T-cell epitope predictor and B-cell epitope predictor both. Our T-cell epitope prediction technology is already being utilized in the oncology field in clinical trials.

In addition to these epitope predictors, we have leveraged an AI population-modelling tool to take the output from the epitope predictors and design a blueprint for a B-cell and universal T-cell vaccine that can provide broad protection against current and future pandemic threats.