

A Viral Enzymatic Reaction Prioritization Tool for Development of Viral Biosensors

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Viruses are small pathogens that are capable of infecting most eukaryotes. Their effect varies from slight to fatal for the infected organism. Viral infections may lead to significant ecological, social, and financial costs. Despite significant advancements in vaccine and virus research, virus viral diseases continue to be a major public health concern. Biosensors, in general, are compact devices that convert bio-recognition processes into measurable signals in a short amount of time. More specifically, viral biosensors are vehicles to detect viruses and are used for clinical diagnosis of viral infections. In this study, we aim to develop a tool that prioritizes the viral enzyme activities for the selected human viruses. The prioritized enzyme activities and their analytes are then used in the development of viral sensors for the respective viruses while decreasing the time, effort, and money spent in wet-lab experiments conducted for viral biosensor development. The tool collects viral enzyme data from public bioinformatics resources including UniProt Knowledgebase and BRENDA Enzyme database and computes the specificity of the enzymatic reactions at different levels of taxa; virus species, family, and genus. Ideally, the identified enzymatic reactions should be specific to one virus species for effectively using its analyte as a viral biosensor. The tool is successfully validated in the development of a neuraminidase-based colorimetric Influenza A biosensor. Grants from University of Muğla Sıtkı Koçman Scientific Research Projects (BAP) Project No: 21/128/01/1/1 are gratefully acknowledged