REVERSE EPITOMICS BASED IDENTIFICATION OF ANTIGENIC PATCHES FOR IMMUNOGENIC COMPOSITIONS

Keywords: multi-epitope, multi-patch, immunogenic, diagnostic, therapeutic, vaccine, infection, SARS-CoV2, coronavirus, rheumatic fever

INVENTION NOVELTY

Provided is a novel innovative approach for developing immunogenic compositions for generating prophylactic or therapeutic vaccines with greater effectiveness, high specificity, and broad coverage of the global human population across ethnicities as well as corresponding diagnostic kits. The novel method is applicable to any pathogen with known proteome. Furthermore, specific vaccine constructs and diagnostic compositions for SARS-CoV-2 and *Streptococcus pyogenes* are provided.

VALUE PROPOSITION

The pathogen's rapid evolutionary adaptation to conventional vaccines and the need of achieving immunogenic effect in the broadest possible human population worldwide are major challenges in vaccine development. Although many different approaches are being pursued for the design of vaccines, the majority of them rely on truncated/full-length single or very limited number of antigenic proteins. This constraint constitutes an increasing threat to make vaccines susceptible to loss of effectiveness due to pathogen´s adaptation, calling for novel strategies to specifically target multiple antigens of a pathogen.

Method "overlapping-epitope-clusters-to-patches" (©Srivastava)
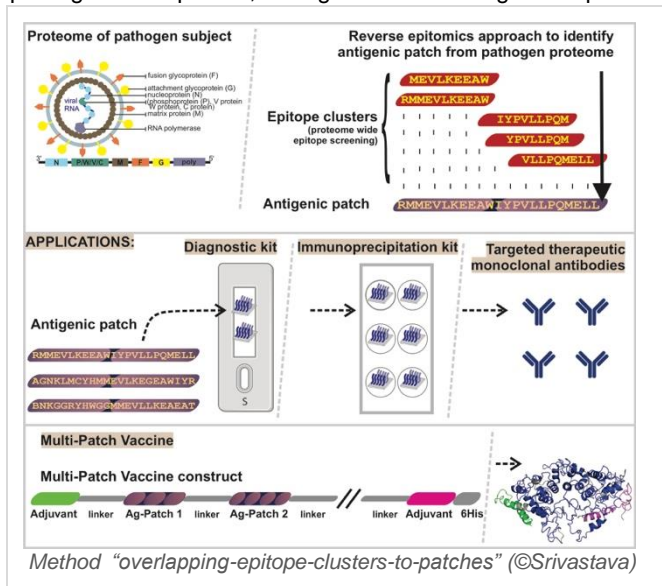
TECHNOLOGY DESCRIPTION

The invention offers a novel, inventive approach for extracting the amino acid sequences of highly immunogenic antigenic patches from the complete proteome of a pathogen. The approach makes use of the "overlapping-epitope-clusters-to-patches" method. Experimental cross validations showed that multiple epitopes respond to patient serum originating from a common region of the proteome, forming a cluster of overlapped epitopes. This common region of the proteome, which is a phenomenon occuring in different pathogens, is named an antigenic patch. Hence, these antigenic patches can be identified from "overlapping-epitope-clusters-to-patches" i.e., by a "reverse epitomics" approach. The resulting immunogenic composition of peptide sequences (Multi-Patches) serve the design of vaccines with broad pathogen coverage, anti-cancer vaccines, immunoprecipitation assay kit or diagnostic kits.

COMMERCIAL OPPORTUNITY

Application in the development of prophylactic and therapeutic vaccines and diagnostics for deferent infectious pathogens. The approach is applicable to any pathogen with known proteome. The technology is offered for co-development and/or licensing.

DEVELOPMENT STATUS

First proof-of-concept was achieved using Ag-patches from cyclized epitopes of SARS-CoV-2 and *Streptococcus pyogenes* validated experimentally as potential immunogenic compositions.

PATENT SITUATION

Priority was filed in September 2020, the international (PCT-)application was published in 2022 (WO2022049595), US (18/023,576), European (EP4208193) and Indian (202011037585) applications are pending.

FURTHER READING

Srivastava et al. 2022. Vaccines Targeting Numerous Coronavirus Antigens, Ensuring Broader Global Population Coverage: Multi-epitope and Multi-patch Vaccines. Vaccine Design, Methods Mol Biol 2022;2410:149-175. doi: 10.1007/978-1-0716-1884-4_7.