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Development of a Subunit Precision Vaccine against Sars-Cov-2

The ongoing corona virus disease (COVID19) pandemic caused by the emergence of the new coronavirus SARS-CoV-2, is urging the development of precision vaccines. We herein, present the development of a subunits vaccine that mimic the natural protective immunity elicited by structural regions of the virus associated with infective power. We have first identified using rational and computational approaches 18 potential epitopes located in a region involved in SARS-CoV-2 high infectivity. Hence, we engineered a series of polypeptides containing these epitopes. We developed an indirect ELISA assay and used it to show that the antibody response, to two polypeptides is highly associated to the asymptomatic and mild forms of the disease in a patients-centered study using a cohort of 500 SARS-CoV-2 PCR- positive COVID19 patients [$p < 0.001$]. Furthermore, immunization of BALBc mice with these polypeptides, using various adjuvants, elicited strong humoral immune response. Upon these findings, we derived different multivalent subunits from the sequences found to elicit a protective immune response. Computational analysis tools showed that these subunits were structurally stable, antigenic and non-allergenic, thus suitable for human precision vaccination. Immunization of BALBc mice with recombinant forms of the engineered subunits using specific adjuvants yielded a strong long lasting humoral and cellular immunity. We have also further engineered these subunits to enhance their immunogenicity through direct triggering of the host TLRs molecules

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