Rational design for the recombinant expression of the Receptor Binding Domain of SARS-CoV-2´ Spike Glycoprotein.

Rodríguez-Martínez LM[1,2], Rodríguez-Perez MA[1], Rodríguez-Casir D[2], Martínez-Rentería RMG[2], and Barrera-Saldaña HA[1,2,3]
[1]CBG-IPN at Reynosa, México., [2]LANSEIDI-CONACyT at Innbiogem, SC and [3]UANL, Monterrey, México.

Abstract

Background: COVID-19 represents a significant threat to global human health. SARS-CoV-2, the etiologic viral agent, needs to be under covered at the structural biology level to facilitate the rational design of diagnostic tests and vaccine candidates. SARS-CoV-2 Receptor Binding Domain of Spike protein (RBD-S) acts as the key to open the gate, to enter the cells during infection. Thus, it is a stronger candidate for designing effective antigens for vaccines and diagnostics. Here, we relied on the viral DNA codifying to RBD-S to use synthetic biology for optimizing the recombinant expression of this (rRBD-S) as a proof of concept of rational designs of bioprocess for vaccine candidates and immunogens to improved rapid diagnostic tests.

Methods: rRBD-S coding sequences inspired on RBD-S ectodomain from SARS-CoV-2 were designed, codon-optimized, tagged, synthesized, cloned in an expression vector (pD444-MR), and transformed into C41(DE3)pLysS *E. coli* strain. Expression of recombinant RBD-S was resulting in a protein purified using Ni-IMAC (Nickel Immobilized metal affinity chromatography).

Results: rRBD-S produced result in a ~30KDa protein with yields of 4.618 gr L-1. Protein was recovered from the bacterial soluble fraction without refolding process.

Conclusions: rRBD-S is an important tool for immunity diagnostics as Lateral-Flow-Devices, structural biology studies, and even as vaccine candidate for combating SARS-CoV-2. Notably considering the advantages of rational subunit vaccines for immune response against other vaccines technologies whose effectiveness in the long-term process has not been demonstrated yet.

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