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Developing a novel mRNA vaccine for tuberculosis: Insights from in silico analysis

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Tuberculosis (TB), the second major cause of deaths among infectious diseases in 2022, is caused by a bacterium (Mycobacterium tuberculosis- MTb), which can be prevented by immunizing infants within the first days of life, as recommended by the Brazilian immunization program. However, the vaccine does not provide effective protection for adults, according to the literature. The immune response to the live attenuated vaccine (Bacillus Calmette-Guérin, BCG) primarily involves antibody production and B cell activation, with a poor cellular immune response in T cell arm. It is known that MTb proteins interact with toll-like receptors (TLR) to induce an inflammatory process that leads to adaptive immunity activation, aiding in T cell recruitment focused on pathogen elimination. Considering this, the present study aimed to develop a messenger RNA (mRNA) vaccine based on targets from previous vaccines currently in clinical evaluation. Preliminary data obtained from “in silico” data allowed the prediction of secondary structures of the selected protein targets and an evaluation of protein-protein interaction between MTb targets and toll-like receptor 2 (TLR2). The findings showed that the proteins had more than 20 residues interacting with TLR2, with a satisfactory root-mean-square deviation (RMSD < 2.0 Å), indicating hydrogen bonds among the structures. This represents a significant ligand-receptor interaction expected to activate the immune response through the contact of toll-like receptors with proteins from the mRNA candidate vaccine, leading to an expected protective T cell response.

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Conflicts of Interest
None