# Multiepitope-based subunit vaccine design and evaluation against respiratory syncytial virus using reverse vaccinology approach


## ABSTRACT

Respiratory syncytial virus (RSV) is primarily associated with respiratory disorders globally. Despite the availability of information, there is still no competitive vaccine available for RSV. Therefore, the present study has been designed to develop a multiepitope-based subunit vaccine (MEV) using a reverse vaccinology approach to curb RSV infections. Briefly, two highly antigenic and conserved proteins of RSV (glycoprotein and fusion protein) were selected and potential epitopes of different categories (B-cell and T-cell) were identified from them. Eminently antigenic and overlapping epitopes, which demonstrated strong associations with their respective human leukocyte antigen (HLA) alleles and depicted collective ~70% coverage of the world's populace, were shortlisted. Finally, 282 amino acids long MEV construct was established by connecting 13 major histocompatibility complex (MHC) class-I with two MHC class-II epitopes with appropriate adjuvant and linkers. Adjuvant and linkers were added to increase the immunogenic stimulation of the MEV. Developed MEV was stable, soluble, non-allergenic, non-toxic, flexible and highly antigenic. Furthermore, molecular docking and molecular dynamics (MD) simulations analyses were carried out. Results have shown a firm and robust binding affinity of MEV with human pathogenic toll-like receptor three (TLR3). The computationally mediated immune response of MEV demonstrated increased interferon-γ production, a significant abundance of immunoglobulin and activation of macrophages which are essential for immune-response against RSV. Moreover, MEV codons were optimized and in silico cloning was performed, to ensure its increased expression. These outcomes proposed that the MEV developed in this study will be a significant candidate against RSV to control and prevent RSV-related disorders if further investigated experimentally.



**Keyword:** Respiratory disorders; Respiratory syncytial virus; Multiepitope-based vaccine; Subunit vaccine; Computational approaches