

WHAT IS CLAIMED:

1. A pre-emptive pan-*coronavirus* vaccine composition, the composition comprising one or more large sequences, wherein each of the one or more large sequences comprise at least one of:
 - a) one or more conserved *coronavirus* B-cell target epitopes;
 - b) one or more conserved *coronavirus* CD4⁺ T cell target epitopes; and/or
 - c) one or more conserved *coronavirus* CD8⁺ T cell target epitopes;wherein at least one epitope is derived from a non-spike protein.
2. The composition of claim 1, wherein the non-spike protein is either encoded by ORF1ab, ORF3a, ORF6, ORF7a, ORF7b, ORF8, ORF10, or derived from an Envelope protein, a Membrane protein, or a Nucleocapsid protein.
3. The composition of claim 2, wherein the non-spike protein comprises a protein encoded by ORF1ab, ORF7a, or a Nucleocapsid protein.
4. The composition of any one of claims 1-3, wherein the one or more large sequences are highly conserved among human and animal *coronaviruses*.
5. The composition of any one of claims 1-4, wherein the one or more large sequences are derived from one or more of: one or more SARS-CoV-2 human strains or variants in current circulation; one or more *coronaviruses* that has caused a previous human outbreak; one or more *coronaviruses* isolated from animals selected from a group consisting of bats, pangolins, civet cats, minks, camels, and other animal receptive to coronaviruses; or one or more *coronaviruses* that cause the common cold.
6. The composition of claim 5, wherein the one or more SARS-CoV-2 human strains or variants are selected from: variant B.1.177; variant B.1.160, variant B.1.1.7; variant B.1.351; variant P.1; variant B.1.427/B.1.429; variant B.1.258; variant B.1.221; variant B.1.367; variant B.1.1.277; variant B.1.1.302; variant B.1.525; variant B.1.526, variant S:677H, and variant S:677P; and wherein the one or more *coronaviruses* that cause the common cold are selected from: 229E alpha coronavirus, NL63 alpha coronavirus, OC43 beta coronavirus, and HKU1 beta coronavirus.
7. The composition of any one of claims 1-6, wherein the one or more large sequences are derived from a whole protein sequence expressed by SARS-CoV-2, derived from a partial protein sequence expressed by SARS-CoV-2, or a combination thereof.
8. The composition of claim 7, wherein the whole protein sequence or the partial protein sequence expressed by SAR-CoV-2 is selected from SEQ ID NO: 182-185, SEQ ID NO: 148-159, SEQ ID NO: 186-187, and SEQ ID NO: 191-196.
9. The composition of any one of claims 1-8, further comprising a T cell attracting chemokine, wherein the T cell attracting chemokine is CCL5, CXCL9, CXCL10, CXCL11, or a combination thereof.
10. The composition of any one of claims 1-9, further comprising a composition that promotes T cell proliferation and T-cell memory, wherein the composition that promotes T cell proliferation and memory is IL-7, IL-2, or IL-15.
11. The composition of any one of claims 1-10, wherein each of the one or more large sequences has at least 25 amino acids.

12. A pre-emptive pan-coronavirus vaccine composition, the composition comprising two or more large sequences, wherein each of the two or more large sequences comprise at least one of:
 - a) one or more conserved coronavirus B-cell target epitopes;
 - b) one or more conserved coronavirus CD4+ T cell target epitopes; and/or
 - c) one or more conserved coronavirus CD8+ T cell target epitopes;wherein at least one large sequence is derived from a non-spike protein and at least one large sequence is derived from a spike protein.
13. The composition of claim 12, wherein each of the two or more large sequences has at least 25 amino acids.
14. The composition of claim 12 or 13, wherein the at least one large sequence derived from the non-spike protein comprises one of SEQ ID NO: 182-185, SEQ ID NO: 150-159, and wherein the at least one large sequence derived from the spike protein comprises one of SEQ ID NO: 148-149, SEQ ID NO: 186-187 and SEQ ID NO: 191-196.
15. The composition of any one of claims 12-14, wherein the non-spike proteins are either encoded by ORF1ab, ORF3a, ORF6, ORF7a, ORF7b, ORF8, ORF10, or derived from an Envelope protein, a Membrane protein, or a Nucleocapsid protein.
16. The composition of claim 15, wherein non-spike protein comprises a protein encoded by ORF1ab, ORF7a, or a Nucleocapsid protein.
17. The composition of any one of claims 12-16, further comprising a T cell attracting chemokine, wherein the T cell attracting chemokine is CCL5, CXCL9, CXCL10, CXCL11, or a combination thereof.
18. The composition of any one of claims 12-17, further comprising a composition that promotes T cell proliferation and T-cell memory, wherein the composition that promotes T cell proliferation and memory is IL-7, IL-2, or IL-15.
19. The composition of any one of claims 1-18, wherein the composition comprises any of SEQ ID NO: 139-147.
20. The composition of any one of claims 1-19, wherein the composition comprises DNA, RNA, mRNA, or a peptide; and the vaccine composition is to be administered via a RNA, a modified mRNA, a peptide delivery system, or a viral vector.