CLAIMS

1. An immunogen, comprising a glycoengineered coronavirus spike protein comprising a plurality of truncated N-glycans, and one or more unmodified O-glycans, wherein the glycoengineered coronavirus spike protein consists of the amino acid sequence of SEQ ID NO: 1 or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NO: 1, or an immunologically active fragment thereof.

2. The immunogen of claim 1, wherein the plurality of truncated N-glycans are monosaccharides.

3. The immunogen of claim 2, wherein the monosaccharidesare are N-acetylglucosamines (GlcNAc).

4. The immunogen of claim 1, wherein the plurality of truncated N-glycans are located in the receptor-binding domain (RBD), thereby exposing a plurality of highly conserved epitopes having amino acid sequences of TESIVRFPNITNL (SEQ ID NO.: 41), NITNLCPFGEVFNATR (SEQ ID NO: 42), LYNSASFSTFK (SEQ ID NO: 43), LDSKVGGNYN (SEQ ID NO: 44), KSNLKPFERDIST (SEQ ID NO: 45), KPFERDISTEIYQAG (SEQ ID NO: 46) and/or GPKKSTNLVKNKC (SEQ ID NO: 47).

5. The immunogen of claim 1, wherein the plurality of truncated N-glycans are located in the heptad repeat 2 (HR2) domain, thereby exposing a plurality of highly conserved epitopes having amino acid sequences of NCDVVIGIVNNTVY (SEQ ID NO: 48), PELDSFKEELDKYFKNHTS (SEQ ID NO: 49), VNIQKEIDRLNEVA (SEQ ID NO: 50), NLNESLIDLQ (SEQ ID NO: 51) and/or LGKYEQYIKWP (SEQ ID NO: 52).

6. The immunogen of claim 1, wherein the glycoengineered coronavirus spike protein is derived from a native coronavirus spike protein by glycoengineering in vitro.

7. The immunogen of claim 6, wherein the native coronavirus spike protein is the spike protein of severe acute respiratory syndrome coronavirus 2 (SAR-CoV-2) or a variant thereof.

8. The immunogen of claim 7, wherein the variant is selected from the group consisting of D614G, Alpha (B.1.1.7 and Q lineages), Beta (B.1.351 and descendent lineages), Gamma (P.1 and

descendent lineages), Epsilon (B.1.427 and B.1.429), Eta (B.1.525), Iota (B.1.526), Kappa (B.1.617.1), 1.617.3, Mu (B.1.621, B.1.621.1), Zeta (P.2), Delta (B.1.617.2 and AY lineages) and Omicron (B.1.1.529 and BA lineages).

9. The immunogen of claim 1, wherein the glycoengineered coronavirus spike protein is present as a trimer.

10. The immunogen of claim 6, wherein the glycoengineered coronavirus spike protein retained the same tertiary structure as the native coronavirus spike protein.

11. The immunogen of claim 4, wherein the glycoengineered coronavirus spike protein is capable of eliciting an enhanced immune response relative to the native coronavirus spike protein.

12. The immunogen of claim 11, wherein the enhanced immune response is an increased IgG titer, an increased IgM titer, an increased neutralization titer, an increased CD4 T cell response, an increased CD8 T cell response, or a combination thereof.

13. The immunogen of claim 6, wherein the glycoengineered spike protein is generated using one or more of chemical or enzymatic methods.

14. The immunogen of claim 13, wherein the glycoengineered spike protein is generated using endoglycosidase H (Endo H).

15. The immunogen of claim 1, wherein the glycoengineered coronavirus spike protein comprises a polypeptide consisting of an amino acid sequence of SEQ ID NO: 1, wherein the polypeptide consists of 22 truncated N-glycans, each having a GlcNAc moiety.

16. The immunogen of claim 1, wherein the glycoengineered coronavirus spike protein comprises a polypeptide consisting of an amino acid sequence of SEQ ID NO: 2, wherein the polypeptide consists of 21 truncated N-glycans, each having a GlcNAc moiety.

17. An immunogenic composition, comprising: (a) the immunogen of any one of claims 1-16, and (b) optionally, an adjuvant.

18. The immunogenic composition of claim 17, wherein the adjuvant is aluminum hydroxide, aluminum phosphate, incomplete Freund's adjuvant (IFA), squalene, Alum, Alhydrogel, MF59, QS-21, CpG 1018, AS03, AS37, Matrix-M or a combination thereof.

19. The immunogenic composition of claim 17, wherein the immunogenic composition is an improved coronavirus vaccine capable of eliciting an enhanced immune response relative to a vaccine using a native coronavirus spike protein.

20. The immunogenic composition of claim 19, wherein the coronavirus is SAR-CoV-2 or a variant thereof.

21. Use of the immunogenic composition according to claim 17 or 18 in the manufacture of a medicament for eliciting an immune response against a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in a subject in need thereof.

22. The use according to claim 17 or 18 wherein the medicament is for producing neutralizing antibodies against SARS-CoV-2 or a variant thereof.

23. The use according to claim 22, wherein the variant is selected from the group consisting of D614G, Alpha (B.1.1.7 and Q lineages), Beta (B.1.351 and descendent lineages), Gamma (P.1 and descendent lineages), Epsilon (B.1.427 and B.1.429), Eta (B.1.525), Iota (B.1.526), Kappa (B.1.617.1), 1.617.3, Mu (B.1.621, B.1.621.1), Zeta (P.2), Delta (B.1.617.2 and AY lineages) and Omicron (B.1.1.529 and BA lineages).

24. Use of the immunogenic composition of claim 17 or 18 in the manufacture of a medicament for protecting a subject in need thereof from infection with SARS-CoV-2 or a variant thereof.

25. Use of the immunogenic composition of claim 17 or 18 in the manufacture of a medicament for preventing a subject in need thereof from contracting COVID-19 disease.