

Claims

1. Recombinant pre-fusion SARS CoV-2 S protein, or a fragment thereof, comprising an S1 and an S2 domain, and comprising at least one mutation selected from the group consisting of a mutation of at least one amino acid in the loop region corresponding to amino acid residues 941 – 945 into G and a disulfide bridge between residues 970 and 999, wherein the numbering of the amino acid positions is according to the numbering of the amino acid positions in SEQ ID NO: 1.
2. The protein according to claim 1, wherein the at least one mutation in the loop region corresponding to amino acid residues 941 – 945 is a mutation of the amino acid at position 941 into G.
3. The protein according to claim 1 or 2, wherein the at least one mutation in the loop region corresponding to amino acid residues 941 – 945 is a mutation of the amino acid at position 943 into G.
4. The protein according to claim 1, 2 or 3, wherein the at least one mutation in the loop region corresponding to amino acid residues 941 – 945 is a mutation of the amino acid at position 944 into G.
5. The protein according to any one of the preceding claims, further comprising a deletion of the furin cleavage site.
6. The protein according to claim 5, wherein the deletion of the furin cleavage site comprises a mutation of the amino acid at position 682 into S and/or a mutation of the amino acid at position 685 into G.
7. The protein according to any one of the preceding claims, further comprising a mutation of the amino acids at position 986 and/or 987 into P.

8. The protein according to any of the preceding claims, comprising an amino acid sequence selected from the group consisting of SEQ ID NO: 8-119, or a fragment thereof.
9. The protein according to anyone of the preceding claims, wherein the proteins do not comprise a signal peptide or a tag sequence.
10. The protein according to any one of the preceding claims, comprising a truncated S2 domain.
11. The protein according to claim 10, wherein the transmembrane and cytoplasmic domain have been removed.
12. The protein according to claim 10 or 11, wherein a heterologous trimerization domain has been linked to the truncated S2 domain.
13. The protein according to claim 12, wherein the heterologous trimerization domain is a foldon domain comprising the amino acid sequence of SEQ ID NO:4.
14. Nucleic acid molecule encoding a protein according to any one of the preceding claims 1-13.
15. Nucleic acid according to claim 14, wherein the nucleic acid molecule is DNA or RNA.
16. Vector comprising a nucleic acid according to claim 14 or 15.
17. Vector according to claim 16, wherein the vector is a human recombinant adenoviral vector.
18. A composition comprising a protein according to any one of the claims 1-13, a nucleic acid according to claim 14 and/or vector according to claim 16 or 17.
19. A vaccine against COVID-19 comprising a protein according to any one of the claims 1-13, a nucleic acid according to claim 14 or 15 and/or vector according to claim 16 or 17.

20. ~~A method for preventing COVID-19, the method comprising administering to the subject a vaccine according to claim 19~~Use of the vaccine according to claim 19 in the manufacture of a medicament for the prevention of COVID-19, wherein the vaccine is to be administered to the subject.
21. ~~A method for reducing infection and/or replication of SARS-CoV-2 in a subject, comprising administering to the subject~~Use of the a composition according to claim 18 or the vaccine according to claim 19 in the manufacture of a medicament for reducing infection and/or replication of SARS-CoV-2 in a subject, wherein the composition or vaccine is to be administered to the subject.
22. An isolated host cell comprising a nucleic acid according to claim 14.
23. An isolated host cell comprising a recombinant human adenovirus of serotype 26 comprising a nucleic acid according to claim 14.
24. The vaccine according to claim 19 for use in preventing COVID-19, wherein the vaccine is to be administered to the subject.
- ~~23.~~25. The composition according to claim 18 or the vaccine according to claim 19 for use in reducing infection and/or replication of SARS-CoV-2 in a subject, wherein the composition or vaccine is to be administered to the subject.