CLAIMS

1. A recombinant respiratory syncytial virus (RSV) antigen comprising an F_2 domain and an F_1 domain of an RSV F protein polypeptide, wherein there is no furin cleavage site between the F_2 domain and the F_1 domain, and wherein the polypeptide further comprises a heterologous trimerization domain positioned C-terminal to the F_1 domain.

2. The recombinant RSV antigen of claim 1, wherein the heterologous trimerization domain is positioned C-terminal to the F_1 domain.

3. The recombinant RSV antigen of claim 1 or 2, comprising an F2 domain and an F1 domain with no intervening furin cleavage site.

4. The recombinant RSV antigen of any one of claims 1-3, wherein the F_2 domain comprises at least a portion of an RSV F protein polypeptide corresponding to amino acids 26-105 of the reference F protein precursor polypeptide (F_0) of SEQ ID NO:2.

5. The recombinant RSV antigen of any one of claims 1-4, wherein the F_1 domain comprises at least a portion of an RSV F protein polypeptide corresponding to amino acids 137-516 of the reference F protein precursor polypeptide (F_0) of SEQ ID NO:2.

6. The recombinant RSV antigen of any of one of claim 1-5, wherein the F_2 domain comprises an RSV F protein polypeptide corresponding to amino acids 26-105 and/or wherein the F_1 domain comprises an RSV F protein polypeptide corresponding to amino acids 137-516 of the reference F protein precursor polypeptide (F_0) of SEQ ID NO:2.

7. The recombinant RSV antigen of any one of claims 1-6, wherein the RSV antigen is selected from the group of:

a) a polypeptide comprising SEQ ID NO:6;

b) a polypeptide that hybridizes under stringent conditions over substantially its entire length to SEQ ID NO:6, which polypeptide comprises an amino acid sequence corresponding to a naturally occurring RSV strain;

c) a polypeptide with at least 95% sequence identity to SEQ ID NO:6, which polypeptide comprises an amino acid sequence does not correspond to a naturally occurring RSV strain.

8. The recombinant RSV antigen of any one of claims 1-7, further comprising a signal peptide.

9. The recombinant RSV antigen of any one of claims 1-8, wherein the heterologous trimerization domain comprises a coiled-coil domain.

10. The recombinant RSV antigen of claim 9, wherein the heterologous trimerization domain comprises an isoleucine zipper.

11. The recombinant RSV antigen of any one of claims 1-10, wherein the RSV antigen comprises at least one modification selected from:

(i) an addition of an amino acid sequence comprising a heterologous trimerization domain;

(ii) a deletion of at least one furin cleavage site;

(iii) a deletion of at least one non-furin cleavage site;

(iv) a deletion of one or more amino acids of the pep27 domain; and

(v) at least one substitution or addition of a hydrophilic amino acid in a hydrophobic domain of the F protein extracellular domain.

12. The recombinant RSV antigen of any one of claims 1-11, wherein the RSV antigen comprises a multimer of polypeptides.

13. The recombinant RSV antigen of claim 12, wherein the RSV antigen comprises a trimer of polypeptides.

14. An immunogenic composition comprising the recombinant RSV antigen of any one of claims 1-13, and a pharmaceutically acceptable carrier or excipient.

15. The immunogenic composition of claim 14, wherein the carrier or excipient comprises a buffer.

16. The immunogenic composition of claim 15, further comprising an adjuvant.

17. The immunogenic composition of any one of claims 14-16, wherein the adjuvant comprises at least one of: 3D-MPL, QS21, an oil-in-water emulsion, and Alum.

18. The immunogenic composition of any one of claims 14-17, wherein the immunogenic composition reduces or prevents infection with Respiratory Syncytial Virus (RSV).

19. The immunogenic composition of any one of claims 14-18, further comprising at least one additional antigen of a pathogenic organism other than RSV.

20. A recombinant nucleic acid comprising a polynucleotide sequence that encodes the recombinant RSV antigen of any one of claims 1-13.

21. The recombinant nucleic acid of claim 20, wherein the polynucleotide sequence that encodes the RSV antigen is codon optimized for expression in a selected host cell.

22. A host cell comprising the nucleic acid of claim 20 or 21.

23. The use of the RSV antigen of any one of claims 1-13 in the preparation of a medicament for treating an RSV infection.

24. The use of the RSV antigen of claim 23, wherein the medicament is administered for the purpose of prophylactically treating an RSV infection.

25. The recombinant RSV antigen of any one of claims 1-13 or the immunogenic composition of any one of claims 14-19 for use in medicine.

26. The recombinant RSV antigen of any one of claims 1-13 or the immunogenic composition of any one of claims 14-19 for the prevention or treatment of RSV-associated diseases.

27. The recombinant RSV antigen of any one of claims 1-13, wherein the recombinant RSV antigen is stabilized in the prefusion conformation of the F protein.

28. The recombinant RSV antigen of any one of claims 1-13 or 27, wherein the recombinant RSV antigen is a soluble RSV F protein polypeptide stabilized in the prefusion conformation of the F protein.

Claims

1. A recombinant respiratory syncytial virus (RSV) antigen comprising a soluble F protein polypeptide comprising an F_2 domain and an F_1 domain of an RSV F protein polypeptide, wherein there is no furin cleavage site between the F_2 domain and the F_1 domain, and wherein the polypeptide further comprises a heterologous trimerization domain positioned C-terminal to the F_1 domain.

2. The recombinant RSV antigen of any one of claim 1, wherein the F_2 domain comprises at least a portion of an RSV F protein polypeptide corresponding to amino acids 26-105 of the reference F protein precursor polypeptide (F_0) of SEQ ID NO:2.

3. The recombinant RSV antigen of any one of claims 1 or 2, wherein the F_1 domain comprises at least a portion of an RSV F protein polypeptide corresponding to amino acids 137-516 of the reference F protein precursor polypeptide (F_0) of SEQ ID NO:2.

4. The recombinant RSV antigen of any of one of claims 1-3, wherein the F_2 domain comprises an RSV F protein polypeptide corresponding to amino acids 26-105 and/or wherein the F_1 domain comprises an RSV F protein polypeptide corresponding to amino acids 137-516 of the reference F protein precursor polypeptide (F_0) of SEQ ID NO:2.

5. The recombinant RSV antigen of any one of claims 1-4, wherein the RSV antigen is a polypeptide comprising SEQ ID NO:6.

6. The recombinant RSV antigen of any one of claims 1-5, further comprising a signal peptide.

7. The recombinant RSV antigen of any one of claims 1-6, wherein the heterologous trimerization domain comprises a coiled-coil domain.

8. The recombinant RSV antigen of claim 7, wherein the heterologous trimerization domain comprises an isoleucine zipper.

9. The recombinant RSV antigen of any one of claims 1-8, wherein the RSV antigen comprises :

(i) a deletion of at least one non-furin cleavage site;

(ii) a deletion of one or more amino acids of the pep27 domain; and

(iii) at least one substitution or addition of a hydrophilic amino acid in a hydrophobic domain of the F protein extracellular domain.

10. An immunogenic composition comprising the recombinant RSV antigen of any one of claims 1-9, and a pharmaceutically acceptable carrier or excipient.

11. The immunogenic composition of claim 10, wherein the carrier or excipient comprises a buffer.

12. The immunogenic composition of claim 11, further comprising an adjuvant.

13. The immunogenic composition of any one of claims 10-12, wherein the adjuvant comprises at least one of: 3D-MPL, QS21, an oil-in-water emulsion, and Alum.

14. The immunogenic composition of any one of claims 10-13, wherein the immunogenic composition reduces or prevents infection with Respiratory Syncytial Virus (RSV).

15. The immunogenic composition of any one of claims 10-14, further comprising at least one additional antigen of a pathogenic organism other than RSV.

16. A recombinant nucleic acid comprising a polynucleotide sequence that encodes the recombinant RSV antigen of any one of claims 1-9.

17. The recombinant nucleic acid of claim 16, wherein the polynucleotide sequence that encodes the RSV antigen is codon optimized for expression in a selected host cell.

18. A host cell comprising the nucleic acid of claim 16 or 17.

19. The use of the RSV antigen of any one of claims 1-9 in the preparation of a medicament for treating an RSV infection.

20. The use of the RSV antigen of claim 19, wherein the medicament is administered for the purpose of prophylactically treating an RSV infection.

21. The recombinant RSV antigen of any one of claims 1-9 or the immunogenic composition of any one of claims 10-15 for use in medicine.

22. The recombinant RSV antigen of any one of claims 1-9 or the immunogenic composition of any one of claims 10-15 for the prevention or treatment of RSV-associated diseases.

23. The recombinant RSV antigen of any one of claims 1-9, wherein the recombinant RSV antigen is stabilized in the prefusion conformation of the F protein.

24. The recombinant RSV antigen of any one of claims 1-9 or 23, wherein the recombinant RSV antigen is a soluble RSV F protein polypeptide stabilized in the prefusion conformation of the F protein.