CLAIMS

1. An RNA molecule comprising at least one open reading frame encoding a respiratory syncytial virus (RSV) fusion protein F (F) polypeptide.

2. The RNA molecule of claim 1, wherein
a) the RSV polypeptide is a full-length, truncated, fragment or variant thereof;
b) the RSV polypeptide comprises at least one mutation;
c) the RSV polypeptide has at least 90%, 95, 96%, 97%, 98% or 99% identity to the amino acid sequence selected from SEQ ID NO: 1 to 6 and 71 to 74;
d) the open reading frame is transcribed from a nucleic acid sequence having at least 90%, 95, 96%, 97%, 98%, or 99% identity to any one of the sequences of SEQ ID NOs: 7 to 10 and 59 to 62;
e) the open reading frame comprises a nucleic acid sequence having at least 90%, 95, 96%, 97%, 98%, or 99% identity to any one of the sequences of SEQ ID NOs: 11 to 16 and 63 to 70;
f) the open reading frame comprises a nucleic acid sequence of any one of SEQ ID NOs: 11 to 16 and 63 to 70;
g) the open reading frame comprises a G/C content of at least 55%, 60%, 65%, 70%, or 75%, or of about 50% to 75% or 55% to 70%; and/or
h) the encoded RSV polypeptide localizes in the cellular membrane, localizes in the Golgi and/or is secreted.

3. The RNA molecule of claim 1 or claim 2, further comprising a 5' untranslated region (5' UTR), optionally wherein the 5' UTR comprises a sequence selected from any of SEQ ID NO: 17 to 19.

4. The RNA molecule of any one of claims 1 to 3, further comprising a 3' untranslated region (3' UTR), optionally wherein the 3' UTR comprises the sequence of any one of SEQ ID NO: 20 to 25.

5. The RNA molecule of any one of claims 1 to 4, wherein the RNA molecule further comprises a 5' cap moiety or a 3' poly-A tail, optionally wherein the poly-A tail comprises a sequence having SEQ ID NO: 26.

6. The RNA molecule of any one of claims 1 to 5, wherein the RNA comprises at least one modified nucleotide.

7. The RNA molecule of claim 6, wherein the modified nucleotide is pseudouridine, N1-methylpseudouridine, N1-ethylpseudouridine, 2-thiouridine, 4′-thiouridine, 5-methylcytosine, 5-methyluridine, 2-thio-1-methyl-1-deaza-pseudouridine, 2-thio-1-methyl-pseudouridine, 2-thio-5-aza-uridine, 2-thio-dihydropseudouridine, 2-thio-dihydrouridine, 2-thio-pseudouridine, 4-methoxy-2-thio-pseudouridine, 4-methoxy-pseudouridine, 4-thio-1-methyl-pseudouridine, 4-thio-pseudouridine, 5-aza-uridine, dihydropseudouridine, 5-methoxyuridine OR 2′-O-methyl uridine.

8. The RNA molecule of claim 7, wherein the modified nucleotide is N1-methylpseudouridine (Ψ).

9. The RNA molecule of any one of claims 1 to 8, wherein the RNA is mRNA.

10. The RNA molecule of claim 9, wherein the RNA is modRNA or saRNA.

11. A composition comprising the RNA molecule of any one of claims 1 to 10, wherein the RNA molecule is formulated in a lipid nanoparticle (LNP).

12. The composition of claim 11, wherein the lipid nanoparticle comprises at least one of a cationic lipid, a PEGylated lipid, a neutral lipid, and a steroid or steroid analog.

13. The composition of claim 12,
wherein the cationic lipid is (4-hydroxybutyl)azanediyl)bis(hexane-6,1-diyl)bis(2-hexyldecanoate) (ALC-0315);
wherein the PEGylated lipid is PEG-modified phosphatidylethanolamine, PEG-modified phosphatidic acid, PEG-modified ceramides (*e.g.* PEG-CerC14 or PEG-CerC20), PEG-modified dialkylamines, PEG-modified diacylglycerols, PEG-modified dialkylglycerols, 2-[(polyethylene glycol)-2000]-N,N-ditetradecylacetamide, glycol-lipids including PEG-c-DOMG, PEG-c-DMA, PEG-s-DMG,N-[(methoxy polyethylene glycol)2000)carbamyl]-1,2-dimyristyloxlpropyl-3-amine (PEG-c-DMA), and PEG-2000-DMG, PEGylated diacylglycerol (PEG-DAG) such as 1 -(monomethoxy-polyethyleneglycol)-2,3-dimyristoylglycerol (PEG-DMG), a PEGylated phosphatidylethanoloamine (PEG-PE), a PEG succinate diacylglycerol (PEG-S-DAG) such as 4-O-(2',3'-di(tetradecanoyloxy)propyl-1-O-((o-methoxy(polyethoxy)ethyl)butanedioate (PEG-S-DMG), a PEGylated ceramide (PEG-cer), or a PEG dialkoxypropylcarbamate such as

co-methoxy(polyethoxy)ethyl-N-(2,3di(tetradecanoxy)propyl)carbamate or 2,3-di(tetradecanoxy)propyl-N-(u>- methoxy(polyethoxy)ethyl)carbamate;
wherein the neutral lipid is distearoylphosphatidylcholine (DSPC), dioleoylphosphatidylcholine (DOPC), dipalmitoylphosphatidylcholine (DPPC), dioleoylphosphatidylglycerol (DOPG), dipalmitoylphosphatidylglycerol (DPPG), dioleoyl-phosphatidylethanolamine (DOPE), palmitoyloleoylphosphatidylcholine (POPC), palmitoyloleoyl-phosphatidylethanolamine (POPE) and dioleoyl-phosphatidylethanolamine 4-(N-maleimidomethyl)-cyclohexane-1carboxylate (DOPE-mal), dipalmitoyl phosphatidyl ethanolamine (DPPE), dimyristoylphosphoethanolamine (DMPE), distearoyl- phosphatidylethanolamine (DSPE), 16-O-monomethyl PE, 16-O-dimethyl PE, 18-1-trans PE, 1-stearioyl-2- oleoylphosphatidyethanol amine (SOPE), or 1,2-dielaidoyl-sn-glycero-3-phophoethanolamine (transDOPE); and/or
wherein the steroid or steroid analog is cholesterol.

14. The composition of claim 12 or claim 13, wherein the PEGylated lipid is 2-[(polyethylene glycol)-2000]-N,N-ditetradecylacetamide (ALC-0159).

15. The composition of any one of claims 12 to 14, wherein the neutral lipid is 1,2-distearoyl-sn-glycero-3-phosphocholine (DSPC).

16. Use of the RNA molecule of any one of claims 1 to 10, in the manufacture of a medicament for inducing an immune response against RSV in a subject.

17. Use of the RNA molecule of any one of claims 1 to 10, in the manufacture of a medicament for preventing, treating or ameliorating an infection, disease or condition associated with RSV in a subject.

18. The use of claim 17, wherein the infection, disease or condition is RSV infection-induced acute respiratory tract illness, including pneumonia and bronchitis.

19. The use of any one of claims 16 to 18, wherein
a) the subject is less than about 1 year of age, about 1 year of age or older, about 5 years of age or older, about 10 years of age or older, about 20 years of age or older, about 30 years of age or older, about 40 years of age or older, about 50 years of age or older, about 60 years of age or older, about 70 years of age or older, or older;
b) the RNA molecule is to be administered as a vaccine; and/or

c) the subject is to be administered a single dose, two doses, three doses, or more, and optionally, a booster dose of the RNA molecule.

20. Use of the composition of any one of claims 12 to 15, in the manufacture of a medicament for inducing an immune response against RSV in a subject.

21. Use of the composition of any one of claims 12 to 15, in the manufacture of a medicament for preventing, treating or ameliorating an infection, disease or condition associated with RSV in a subject.