Claims

1. A pharmaceutical composition comprising or consisting of
   - at least one component A comprising at least one ~~nucleic acid~~mRNA comprising at least one coding sequence encoding at least one antigenic peptide or protein selected or derived from ~~at least one Coronavirus, or an immunogenic fragment or immunogenic variant thereof~~a SARS-CoV-2 virus, wherein the at least one antigenic peptide or protein is a SARS-CoV-2 spike protein comprising or consisting of at least one amino acid sequence being identical or at least 90% identical to SEQ ID NO: 10, wherein the SARS-CoV-2 spike protein comprises a pre-fusion stabilizing K986P and V987P mutation, and
   - at least one component B comprising ~~at least one nucleic acid comprising at least one coding sequence encoding at least one~~a plurality of mRNAs, wherein the plurality of mRNAs encodes at least one, preferably 2, 3, 4, 5, 6 antigenic peptide or protein selected or derived from HA and at least one, preferably 2, 3, 4, 5, 6 antigenic peptide or protein selected or derived from NA of at least one Influenza A virus and at least one ~~further virus, or an immunogenic fragment or immunogenic variant thereof.~~Influenza B virus,

   wherein the at least one mRNA of component A and/or the plurality of mRNAs of component B is/are complexed or associated with one or more lipids, thereby forming lipid nanoparticles (LNPs).

2. Pharmaceutical composition of claim 1, wherein the ~~at least one further virus of component B is selected from at least one different Coronavirus, at least one Influenza virus, at least one Pneumoviridae virus, and/or at least one Paramyxoviridae virus~~SARS-CoV-2 spike protein comprises the amino acid substitution D614G.

3. Pharmaceutical composition of ~~claim 2, wherein the at least one Pneumoviridae virus is selected from at least one Respiratory syncytial virus, and/or at least one Metapneumovirus.~~

4. ~~Pharmaceutical composition of claim 2, wherein the at least one Paramyxoviridae virus is selected from at least one Parainfluenza virus, and/or at least one Henipavirus.~~

5. ~~Pharmaceutical composition of any one of the preceding~~ claims~~,~~ 2 to 5,

wherein the at least one ~~Coronavirus of component A is selected from at least one pandemic Coronavirus.~~

6. Pharmaceutical composition of any one of the preceding claims, wherein the at least one Coronavirus of component A is selected from at least one Alphacoronavirus, at least one Betacoronavirus, at least one Gammacoronavirus, and/or at least one Deltacoronavirus.

7. Pharmaceutical composition of any one of the preceding claims, wherein the at least one Coronavirus of component A, *preferably* the Betacoronavirus, is selected from at least one Sarbecovirus, at least one Merbecovirus, at least one Embecovirus, at least one Nobecovirus, and/or at least one Hibecovirus.

8. Pharmaceutical composition of claim 7, wherein the at least one Sarbecovirus is selected from a SARS-CoV-1 virus and/or a SARS-CoV-2 virus.

9. Pharmaceutical composition of claim 7, wherein the at least one Merbecovirus is selected from a MERS-CoV virus.

10. Pharmaceutical composition of any one of the preceding claims, wherein the at least one Coronavirus of component A is a SARS-CoV-2 virus.

11. Pharmaceutical composition of claim 10, wherein the at least one antigenic peptide or protein encoded by the at least one nucleic acid of component A comprises or consists at least one peptide or protein selected or derived from a SARS-CoV-2 spike protein (S, S1, S2, or S1 and S2), or an immunogenic fragment or immunogenic variant of any of these.

12. Pharmaceutical composition of claims 11, wherein the spike protein is selected or derived from a pre-fusion stabilized spike protein (S_stab) comprising at least one pre-fusion stabilizing mutation.

13. Pharmaceutical composition of claim 12 wherein the at least one pre-fusion stabilizing mutation comprises the following amino acid substitutions: K986P and V987P.

14. Pharmaceutical composition of claim 12 to 13, wherein the at least one pre-fusion stabilizing mutation comprises a cavity filling mutation, *preferably* selected from the list comprising T887W; A1020W; T887W and A1020W; or P1069F.

15. Pharmaceutical composition of claims 12 to 14, wherein the at least one pre-fusion stabilizing mutation comprises a mutated protonation site, *preferably* selected from the list comprising H1048Q and H1064N; H1083N and H1101N; or H1048Q and H1064N and H1083N and H1101N.

16. Pharmaceutical composition of claims 12 to 15, wherein the at least one pre-fusion stabilizing mutation comprises at least one artificial intramolecular disulfide bond, *preferably* selected from the list comprising I712C and T1077C; I714C and Y1110C; P715C and P1069C; G889C and L1034C; I909C and Y1047C; Q965C and S1003C; F970C and G999C; A972C and R995C; A890C and V1040C; T874C and S1055C; N914C and S1123C; or N914C and S1123C.

17. Pharmaceutical composition of claims 10 to 16, wherein the at least one nucleic acid of component A additionally encodes at least one heterologous peptide or protein element selected or derived from a signal peptide, a linker, a helper epitope, an antigen clustering element, a trimerization element, a transmembrane element, and/or a VLP-forming sequence.

18. Pharmaceutical composition of claim 17, wherein the at least one heterologous antigen clustering element is selected or derived from a ferritin element, a lumazine synthase element, a surface antigen of Hepatitis B virus (HBsAg), or encapsulin and/or wherein the at least one heterologous trimerization element is selected or derived from a foldon element, preferably a fibritin foldon element and/or wherein the at least one VLP-forming sequence is selected or derived from a Woodchuck hepatitis core antigen element (WhcAg).

19. Pharmaceutical composition of claims 10 to 18, wherein the at least one antigenic peptide or protein selected or derived from SARS-CoV-2 encoded by the at least one nucleic acid of component A comprises or consists of at least one of the amino acid sequences being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of SEQ ID NOs: 1-111, 274-11663, 13176-13510, 13521-14123, 22732-22758, 22917, 22923, 22929-22964, 26938, or 26939 or an immunogenic fragment or immunogenic variant of any of these.

20. Pharmaceutical composition of claims 10 to 19, wherein the at least one antigenic peptide or protein selected or derived from SARS-CoV-2 encoded by the at least one nucleic acid of component A comprises or consists of at least one of the amino acid sequences being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of SEQ ID NOs: 10-26, 40-48, 85-111, 341-1278, 1681-2618, 2686-3623, 3691-4628, 4696-5633, 5701-6638, 6706-7643, 7711-8648, 8716-9653, 9721-10658, 10726-11663, 13377-13510, 13521-14123, 22732, 22738, 22740, 22742, 22744, 22746, 22748, 22750, 22752, 22754, 22756, 22758, 22947-22964 or an immunogenic fragment or immunogenic variant of any of these.

~~21. Pharmaceutical composition of claims 10 to 20, wherein the at least one antigenic peptide or protein is an S protein comprising a pre-fusion stabilizing K986P and V987P mutation comprising or consisting of at least one amino acid sequence being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to SEQ ID NOs: 10, 341, 22960, 22961, 22963 or an immunogenic fragment or immunogenic variant thereof.~~

~~22. Pharmaceutical composition of claims 10 to 21, wherein the at least one coding sequence of the at least one nucleic acid of component A comprises or consists at least one nucleic acid sequence encoding a SARS-CoV-2 antigen being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of the nucleic acid sequences selected from SEQ ID NOs: 116-132, 134-138, 140-143, 145-147, 148-175, 11664-11813, 11815, 11817-12050, 12052, 12054-13147, 13514, 13515, 13519, 13520, 14124-14177, 22759, 22764-22786, 22791-22813, 22818-22839, 22969-23184, 23189-23404, 23409-23624, 23629-23844, 23849-24064, 24069-24284, 24289-24504, 24509-24724, 24729-24944, 24949-25164, 25169-25384, 25389-25604, 25609-25824, 25829-26044, 26049-26264, 26269-26484, 26489-26704, 26709-26937 or a fragment or variant of any of these sequences.~~

~~23. Pharmaceutical composition of claims 10 to 22, wherein the at least one coding sequence of the at least one nucleic acid of component A is a codon modified coding sequence comprising or consisting of a nucleic acid sequence encoding a SARS-CoV-2 antigen being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of the nucleic acid sequences selected from SEQ ID NOs: 136-138, 140-143, 145-147, 148-175, 11731-11813, 11815, 11817-12050, 12052, 12054-13147, 14142-14177, 22759, 22764-22786, 22791-22813, 22818-22839, 22969-23184, 23189-23404, 23409-23624, 23629-23844, 23849-24064, 24069-24284, 24289-24504, 24509-24724, 24729-24944, 24949-25164, 25169-25384, 25389-25604, 25609-25824, 25829-26044, 26049-26264, 26269-26484, 26489-26704, 26709-26937 or a fragment or variant of any of these sequences.~~

~~24. Pharmaceutical composition of claims 10 to 23, wherein the at least one nucleic acid~~mRNA of component A comprises or consists of a nucleic acid sequence encoding a SARS-CoV-2 antigen which is identical or at least ~~70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from SEQ ID NOs: 148-175, 12204-13147, 14142-14177, 22786-22839, 23189-23404, 23409-23624, 23629-23844, 23849-24064, 24069-24284, 24289-24504, 24509-24724, 24729-24944, 24949-25164, 25169-25384, 25389-25604, 25609-25824, 25829-26044,~~

~~26049-26264, 26269-26484, 26489-26704, 26709-26937 or a fragment or variant of any of these sequences.~~

~~25. Pharmaceutical composition of claims 10 to 24, wherein the at least one nucleic acid of component A comprises or consists of a nucleic acid sequence encoding a SARS-CoV-2 antigen which is identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%,~~ 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from SEQ ID NOs: 149, 163, 24837, 26633, 26907~~, or a fragment or variant of any of these sequences~~.

~~26. Pharmaceutical composition of claims 10 to 24, wherein the at least one nucleic acid of component A comprises or consists of a nucleic acid sequence encoding a SARS-CoV-2 antigen which is identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from SEQ ID NOs: 23311, 23531, 24851, 23310, 23530, 24850, 23313, 23533, 24853, 23314, 23534, 24854 or a fragment or variant of any of these sequences.~~

~~27. Pharmaceutical composition of any one of the preceding claims, wherein the Coronavirus of component A is a SARS-associated virus, *preferably* a SARS-CoV-1 virus.~~

~~28. Pharmaceutical composition of claim 27, wherein the at least one antigenic peptide or protein encoded by the at least one nucleic acid of component A comprises or consists at least one peptide or protein selected or derived from a spike protein (S, S1, S2, or S1 and S2), or an immunogenic fragment or immunogenic variant of any of these.~~

~~29. Pharmaceutical composition of claims 28, wherein the spike protein is selected or derived from a pre-fusion stabilized spike protein (S_stab) comprising at least one pre-fusion stabilizing mutation.~~

~~30. Pharmaceutical composition of claim 29 wherein the at least one pre-fusion stabilizing mutation comprises the following amino acid substitutions: K968P and V969P.~~

~~31. Pharmaceutical composition of claim 29 to 30, wherein the at least one pre-fusion stabilizing mutation comprises at least one selected from at least one cavity filling mutation, at least one mutated protonation site, and/or at least one artificial intramolecular disulfide bond.~~

~~32. Pharmaceutical composition of claims 27 to 31, wherein the at least one antigenic peptide or protein selected or derived from a SARS-associated virus encoded by the at least one nucleic acid of component A comprises or consists of at least one of the amino acid~~

~~sequences being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of SEQ ID NOs: 14906-14950 or an immunogenic fragment or immunogenic variant of any of these.~~

~~33. Pharmaceutical composition of claims 27 to 32, wherein the at least one coding sequence of the at least one nucleic acid of component A comprises or consists at least one nucleic acid sequence encoding a SARS associated virus antigen being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of the nucleic acid sequences selected from SEQ ID NOs: 14951-15220 or a fragment or variant of any of these sequences.~~

~~34. Pharmaceutical composition of claims 27 to 33, wherein the at least one nucleic acid of component A comprises or consists of a nucleic acid sequence encoding a SARS associated virus antigen which is identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from SEQ ID NOs: 15041-15220 or a fragment or variant of any of these sequences.~~

~~35. Pharmaceutical composition of any one of the preceding claims, wherein the Coronavirus of component A is a MERS-CoV virus.~~

~~36. Pharmaceutical composition of claim 35, wherein the at least one antigenic peptide or protein encoded by the at least one nucleic acid of component A comprises or consists at least one peptide or protein selected or derived from a MERS-CoV coronavirus spike protein (S, S1, S2, or S1 and S2), or an immunogenic fragment or immunogenic variant of any of these.~~

~~37. Pharmaceutical composition of claims 36, wherein the spike protein is selected or derived from a pre-fusion stabilized spike protein (S_stab) comprising at least one pre-fusion stabilizing mutation.~~

~~38. Pharmaceutical composition of claim 37 wherein the at least one pre-fusion stabilizing mutation comprises the following amino acid substitutions: V1060P and L1061P.~~

~~39. Pharmaceutical composition of claim 37 to 38, wherein the at least one pre-fusion stabilizing mutation comprises at least one selected from at least one cavity filling mutation, at least one mutated protonation site, and/or at least one artificial intramolecular disulfide bond.~~

~~40. Pharmaceutical composition of claims 35 to 39, wherein the at least one antigenic peptide or protein of MERS-CoV encoded by the at least one nucleic acid of component A comprises or consists of at least one of the amino acid sequences being identical or at least 70%, 80%,~~

~~85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of SEQ ID NOs: 14794-14809 or an immunogenic fragment or immunogenic variant of any of these.~~

~~41. Pharmaceutical composition of claims 35 to 40, wherein the at least one coding sequence of the at least one nucleic acid of component A comprises or consists at least one nucleic acid sequence encoding a MERS-CoV antigen being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of the nucleic acid sequences selected from SEQ ID NOs: 14810-14905 or a fragment or variant of any of these sequences.~~

~~42. Pharmaceutical composition of claims 35 to 41, wherein the at least one nucleic acid of component A comprises or consists of a nucleic acid sequence encoding a MERS-CoV antigen which is identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from SEQ ID NOs: 14842-14905 or a fragment or variant of any of these sequences.~~

~~43. Pharmaceutical composition of any one of the preceding claims, wherein the at least one further virus of component B is selected from at least one different Coronavirus, wherein said at least one different Coronavirus is not the Coronavirus of component A, *preferably* wherein the at least one different Coronavirus is not SARS-CoV-2.~~

~~44. Pharmaceutical composition of claim 43, wherein the at least one nucleic acid of component B is selected from at least one nucleic acid encoding a Coronavirus antigen as defined in any one of claims 5 to 42.~~

~~45. Pharmaceutical composition of any one of the preceding claims, wherein the at least one further virus of component B is selected from at least one Influenza virus.~~

~~46. Pharmaceutical composition of claim 45~~4. Pharmaceutical composition of any one claims 1 to 3, wherein at least one Influenza virus is selected from Influenza A, Influenza B or Influenza C, *preferably* wherein the at least one Influenza virus is selected from at least one Influenza A virus and/or at least one Influenza B virus.

~~47~~5. Pharmaceutical composition of claim ~~45 or 46~~4, wherein the at least one Influenza virus is selected from at least one Influenza A virus selected from at least one of the list comprising ~~H1N1, H1N2~~H1 N1, H1 N2, H2N2, H3N1, H3N2,H3N8,H5N1,H5N2,H5N3,H5N8,H5N9,H7N1,H7N2, H7N3, H7N4, H7N7,

H7N9,H9N2,H10N7 and H10N8, *preferably* from at least one of ~~H1N1~~H1 N1, H3N2, H5N1, H5N8.

~~48. Pharmaceutical composition of claim 45 to 47, wherein the at least one antigenic peptide or protein encoded by the at least one nucleic acid of component B comprises or consists at least one peptide or protein selected or derived from at least one hemagglutinin (HA) or neuraminidase (NA) or an immunogenic fragment or immunogenic variant of any of these.~~

~~49. Pharmaceutical composition of claims 45 to 48~~6. Pharmaceutical composition of claim 4 or 5, wherein the at least one antigenic peptide or protein selected or derived from at least one Influenza virus encoded by the at least one ~~nucleic acid~~mRNA of component B comprises or consists of at least one of the amino acid sequences being identical or at least ~~70%, 80%, 85%, 86%, 87%, 88%, 89%,~~ 90%, 91 %, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of SEQ ID NOs: 14178-14229, ~~or an immunogenic fragment or immunogenic variant of any of these.~~

~~50. Pharmaceutical composition of claims 45 to 49,~~ and/or

wherein the at least one coding sequence of the at least one ~~nucleic acid~~mRNA of component B comprises or consists at least one nucleic acid sequence encoding ~~a~~an Influenza virus antigen being identical or at least ~~70%, 80%, 85%, 86%, 87%, 88%, 89%,~~ 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of the nucleic acid sequences selected from SEQ ID NOs: 14230-14333, 14334-14541, 26946, 26947-26955 ~~or a fragment or variant of any of these sequences.~~, preferably

~~51. Pharmaceutical composition of claims 45 to 50,~~ wherein the at least one ~~coding sequence of the at least one nucleic acid of component B comprises or consists at least one nucleic acid sequence encoding an Influenza A HA antigen being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of the nucleic acid sequences selected from SEQ ID NOs: 14230-14233, 14236-14256, 14282-14285, 14288-14308, 14334-14337, 14340-14360, 14386-14389, 14392-14412, 14438-14441, 14444-14464, 14490-14493, 14496-14516, 26946-26950 or a fragment or variant of any of these sequences.~~

~~52. Pharmaceutical composition of claims 45 to 51, wherein the at least one coding sequence of the at least one nucleic acid of component B comprises or consists at least one nucleic acid sequence encoding an Influenza A NA antigen being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of the nucleic acid sequences selected from SEQ ID NOs: 14366-14369, 14372-~~

~~14383, 14418-14421, 14424-14435, 14470-14473, 14476-14487, 14522-14525, 14528-14539, 26953, 26954 or a fragment or variant of any of these sequences.~~

~~53. Pharmaceutical composition of claims 45 to 52, wherein the at least one coding sequence of the at least one nucleic acid of component B comprises or consists at least one nucleic acid sequence encoding an Influenza B antigen being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of the nucleic acid sequences selected from SEQ ID NOs: 14234, 14235, 14257-14261, 14266, 14267, 14280, 14281, 14286, 14287, 14309-14313, 14318, 14319, 14332, 14333, 14338, 14339, 14361-14365, 14370, 14371, 14384, 14385, 14390, 14391, 14413-14417, 14422, 14423, 14436, 14437, 14442, 14443, 14465-14469, 14474, 14475, 14488, 14489, 14494, 14495, 14517-14521, 14526, 14527, 14540, 14541, 26951, 26952, 26955, or a fragment or variant of any of these sequences.~~

~~54. Pharmaceutical composition of claims 45 to 53, wherein the at least one nucleic acid~~mRNA of component B comprises or consists of a nucleic acid sequence encoding an Influenza virus antigen which is identical or at least ~~70%, 80%, 85%, 86%, 87%, 88%, 89%,~~ 90%, 91 %, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from SEQ ID NOs: 14334-14541, 26947-26955~~, or a fragment or variant of any of these sequences~~.

~~55~~7. Pharmaceutical composition of any one of claims ~~45~~4 to ~~54~~6, wherein component B comprises a plurality of ~~nucleic acid~~mRNA sequences encoding an Influenza virus antigen, *preferably* 2, 3, 4, 5, 6, 7, 6, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, or 100 of nucleic acid sequences encoding an Influenza virus antigen~~, *preferably* wherein each of the plurality is selected from nucleic acid sequences defined in claims 45 to 54~~.

~~56~~8. Pharmaceutical composition of ~~claim 55, wherein the plurality of nucleic acid sequences encodes at least~~any one~~, *preferably* 2, 3, 4, 5, 6 antigenic peptide or protein selected or derived from HA and at least one, *preferably* 2, 3, 4, 5, 6 antigenic peptide or protein selected or derived from NA of at least one Influenza A virus.~~

~~57. Pharmaceutical composition of claim 55 or 56, wherein the plurality of nucleic acid sequences encodes at least one, *preferably* 2, 3, 4, 5, 6 antigenic peptide or protein selected or derived from HA and at least one, *preferably* 2, 3, 4, 5, 6 antigenic peptide or protein selected or derived from NA of at least one Influenza B virus.~~

58. ~~Pharmaceutical composition~~ of claims ~~45~~4 to ~~57~~7, wherein component B comprises a plurality of ~~nucleic acid~~mRNA sequences encoding an Influenza virus antigen, wherein the Influenza virus is selected from the list comprising FLUAV/~~H1N1~~H 1 N1/A/California/7 /2009, FLUAV/~~H1N1~~H 1 N1/A/Michigan/45/2015, FLUAV/~~H1N1~~H1 N1/A/Netherlands/602/2009, FLUAV/H3N2/A/Hong Kong/4801/2014, FLUBV/~~H0N0~~HONO/B/Brisbane/60/2008, FLUBV/~~H0N0~~HONO/B/Phuket/3073/2013~~.~~

~~59. Pharmaceutical composition of claims 45 to 57,~~ or

wherein component B comprises a plurality of ~~nucleic acid~~mRNA sequences, *preferably* seven ~~nucleic acid~~mRNA sequences, encoding a plurality of Influenza virus antigens, *preferably* seven Influenza virus antigens, wherein the influenza virus antigens are selected from

- HA protein of FLUAV/H3N2/A/Hong Kong/4801/2014,
- HA protein of FLUAV/~~H1N1~~H1 N1/A/California/7/2009,
- HA protein of FLUBV/~~H0N0~~HONO/B/Phuket/3073/2013,
- HA protein of FLUBV/~~H0N0~~HONO/B/Brisbane/60/2008,
- NA protein of FLUAV/H3N2/A/Hong Kong/4801/2014,
- NA protein of FLUAV/~~H1N1~~H1 N1/A/California/7/2009, and
- NA protein of FLUBV/~~H0N0~~HONO/B/Brisbane/60/2008.

~~60~~9. Pharmaceutical composition of any one of the preceding claims, wherein the at least one ~~further virus~~coding sequence of the mRNA of component ~~B is selected from at least one Respiratory syncytial virus (RSV) of the Pneumoviridae virus family.~~

~~61. Pharmaceutical composition of claim 60 wherein~~ A and/or the at least one ~~antigenic peptide or protein encoded by the at least one nucleic acid of component B comprises or consists at least one peptide or protein selected or derived from at least one RSV fusion protein F, matrix protein M, nucleoprotein N, M2-1 protein, and/or phosphoprotein P, or an immunogenic fragment or immunogenic variant of any of these, *preferably* selected or derived from RSV fusion protein F, or an immunogenic fragment or immunogenic variant thereof.~~

~~62. Pharmaceutical composition of claim 61, wherein the at least one antigenic peptide or protein selected or derived from RSV F protein is a full-length F protein (F0) or an F protein with deleted C-terminus (F-del), or an immunogenic fragment or immunogenic variant thereof.~~

63. Pharmaceutical composition of claims 61 to 62, wherein the RSV F protein is selected or derived from a pre-fusion stabilized F protein (F_stab) comprising at least one pre-fusion stabilizing mutation.

64. Pharmaceutical composition of claim 61 to 63, wherein the RSV F protein comprises the two subunits F2 and F1 in a single polypeptide chain, wherein F2 and F1 are connected via a linker element, *preferably* a GS linker to generate a stable F2-linker-F1 protein, *optionally* wherein said F2-linker-F1 protein lacks aa104-aa144.

65. Pharmaceutical composition of claims 60 to 64, wherein the at least one antigenic peptide or protein selected or derived from at least one RSV encoded by the at least one nucleic acid of component B comprises or consists of at least one of the amino acid sequences being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of SEQ ID NOs: 14542-14551, or an immunogenic fragment or immunogenic variant of any of these.

66. Pharmaceutical composition of claims 60 to 65, wherein the at least one coding sequence of the at least one nucleic acid of component B comprises or consists of a nucleic acid sequence encoding an RSV antigen comprising or consisting of a nucleic acid sequence being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of the nucleic acid sequences selected from SEQ ID NOs: 14552-14571, 14572-14611, or a fragment or variant of any of these sequences.

67. Pharmaceutical composition of claims 60 to 66, wherein the at least one nucleic acid of component B comprises or consists of a nucleic acid sequence encoding an RSV antigen which is identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from SEQ ID NOs: 14572-14611, or a fragment or variant of any of these sequences.

68. Pharmaceutical composition of claims 60 to 67 comprising at least one, two or three further nucleic acid sequences comprising at least one coding sequence encoding at least one antigenic peptide or protein selected or derived from RSV matrix protein M, nucleoprotein N, M2-1 protein, and/or phosphoprotein P or combinations thereof, preferably selected from M2-1.

69. Pharmaceutical composition of claim 68, wherein the at least one coding sequence of the at least one further artificial nucleic acid sequences encodes at least one of the amino acid sequences being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%,

92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of SEQ ID NOs: 9684, 10053-10133, 10134, 10503-10636, 10637, 11006-11182, 11183, 11552-11725, 19844, 20213, 20582, 20951 of published PCT application WO2019202035, or a fragment or variant of any of these sequences.

70. Pharmaceutical composition of claims 68 to 69, wherein the at least one coding sequence of the at least one further nucleic acid sequence comprises or consists of a nucleic acid sequence encoding an RSV antigen comprising or consisting of a nucleic acid sequence being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of the nucleic acid sequences selected from SEQ ID NOs: 9685-9692, 10135-10142, 10638-10645, 11184-11119, 19845-19852, 20214-20221, 20583-20590, 20952-20959, 21385-21388, 21411-21414 of published PCT application WO2019202035, or a fragment or variant of any of these sequences.

71. Pharmaceutical composition of claims 68 to 70, wherein the at least one further nucleic acid comprises or consists of a nucleic acid sequence encoding an RSV antigen which is identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from SEQ ID NOs: 9693-10052, 10143-10502, 10646-11005, 11192-11551, 19853-20212, 20222-20581, 20591-20950, 20960-21319, 21481-21488, 21627-21634, 21553-21560, 21699-21706 of published PCT application WO2019202035, or a fragment or variant of any of these sequences.

72. Pharmaceutical composition of any one of the preceding claims, wherein the at least one further virus of component B is selected from at least one Metapneumovirus, *preferably* a human Metapneumovirus (hMPV) of the Pneumoviridae virus family.

73. Pharmaceutical composition of claim 72 wherein the at least one antigenic peptide or protein encoded by the at least one nucleic acid of component B comprises or consists at least one peptide or protein selected or derived from at least one hMPV F protein, G protein, M protein, P protein, N protein and SH protein, or an immunogenic fragment or immunogenic variant thereof.

74. Pharmaceutical composition of claims 72 to 73, wherein the at least one antigenic peptide or protein selected or derived from at least one hMPV encoded by the at least one nucleic acid of component B comprises or consists of at least one of the amino acid sequences being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of SEQ ID NOs: 14626-14649, 26966-26971, or an immunogenic fragment or immunogenic variant of any of these.

75. Pharmaceutical composition of claims 72 to 74, wherein the at least one coding sequence of the at least one nucleic acid of component B comprises or consists of a nucleic acid sequence encoding an hMPV antigen comprising or consisting of a nucleic acid sequence being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of the nucleic acid sequences selected from SEQ ID NOs: 14650-14697, 14698-14793, 26972-26978, 26979-26991, or a fragment or variant of any of these sequences.

76. Pharmaceutical composition of claims 72 to 75, wherein the at least one nucleic acid of component B comprises or consists of a nucleic acid sequence encoding an hMPV antigen which is identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from SEQ ID NOs: 14698-14793, 26979-26991, or a fragment or variant of any of these sequences.

77. Pharmaceutical composition of any one of the preceding claims, wherein the at least one further virus of component B is selected from at least one Parainfluenza virus (PIV), *preferably* a human Parainfluenzavirus (hPIV) of the Paramyxoviridae virus family.

78. Pharmaceutical composition of claim 77, wherein the at least one PIV is selected from hPIV-1, hPIV-2, or hPIV-3 serotype, *preferably* hPIV-3 serotype.

79. Pharmaceutical composition of claim 77 or 78 wherein the at least one antigenic peptide or protein encoded by the at least one nucleic acid of component B comprises or consists at least one peptide or protein selected or derived from at least one PIV hemagglutinin-neuraminidase (HN), PIV fusion (F) glycoprotein, PIV matrix protein (M), PIV nucleocapsid protein (N), PIV viral replicase (L), PIV non-structural V protein, or an immunogenic fragment thereof.

80. Pharmaceutical composition of claims 77 to 79, wherein the at least one antigenic peptide or protein selected or derived from at least one PIV encoded by the at least one nucleic acid of component B comprises or consists of at least one of the amino acid sequences being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of SEQ ID NOs: 14612, 14613, 26956, 26957, or an immunogenic fragment or immunogenic variant of any of these.

81. Pharmaceutical composition of claims 77 to 80, wherein the at least one coding sequence of the at least one nucleic acid of component B comprises or consists of a nucleic acid sequence encoding an PIV antigen comprising or consisting of a nucleic acid sequence being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%,

94%, 95%, 96%, 97%, 98%, or 99% identical to any one of the nucleic acid sequences selected from SEQ ID NOs: 14614-14617, 14618-14625, 26958-26965, or a fragment or variant of any of these sequences.

82. Pharmaceutical composition of claims 77 to 81, wherein the at least one nucleic acid of component B comprises or consists of a nucleic acid sequence encoding an PIV antigen which is identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from SEQ ID NOs: 14618-14625, 26961-26965, or a fragment or variant of any of these sequences.

83. Pharmaceutical composition of any one of the preceding claims, wherein the at least one further virus of component B is selected from at least one Henipavirus of the Paramyxoviridae virus family.

84. Pharmaceutical composition of claim 83, wherein the at least one Henipavirus is selected from at least one Hendra virus and/or at least one Nipah virus.

85. Pharmaceutical composition of claim 83 or 84, wherein the at least one antigenic peptide or protein encoded by the at least one nucleic acid of component B comprises or consists at least one peptide or protein selected or derived from at least one Henipavirus glycoprotein and/or at least one Henipavirus fusion protein or a fragment or variant thereof.

86. Pharmaceutical composition of claims 83 to 85, wherein the at least one antigenic peptide or protein selected or derived from at least one Henipavirus encoded by the at least one nucleic acid of component B comprises or consists of at least one of the amino acid sequences being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of SEQ ID NOs: 1-26, 573-598, 807-832, 1041-1066, 1513-1515 of published PCT patent application WO2018115507 or an immunogenic fragment or immunogenic variant of any of these.

87. Pharmaceutical composition of claims 83 to 86, wherein the at least one coding sequence of the at least one nucleic acid of component B comprises or consists of a nucleic acid sequence encoding an Henipavirus antigen comprising or consisting of a nucleic acid sequence being identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of the nucleic acid sequences selected from SEQ ID NOs: 27-234, 599-806, 833-1040, 1067-1274, 1275-1508, 1516-1539, 1540-1548 of published PCT patent application WO2018115507 or a fragment or variant of any of these sequences.

88. Pharmaceutical composition of claims 83 to 87, wherein the at least one nucleic acid of component B comprises or consists of a nucleic acid sequence encoding an Henipavirus antigen which is identical or at least 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from SEQ ID NOs: 1275-1508, 1540-1548 of published PCT patent application WO2018115507 or a fragment or variant of any of these sequences.

89. Pharmaceutical composition of any one of the preceding claims, wherein component A is selected from at least one of component

A-1 at least one nucleic acid comprising at least one coding sequence encoding at least one antigenic peptide or protein selected or derived from at least one SARS-CoV-2 or an immunogenic fragment or immunogenic variant thereof, *preferably* as defined in claims 10 to 26, and/or

A-2 at least one nucleic acid comprising at least one coding sequence encoding at least one antigenic peptide or protein selected or derived from at least one SARS associated virus or an immunogenic fragment or immunogenic variant thereof, *preferably* as defined in claims 27 to 34, and/or

A-3 at least one nucleic acid comprising at least one coding sequence encoding at least one antigenic peptide or protein selected or derived from at least one MERS-CoV or an immunogenic fragment or immunogenic variant thereof, *preferably* as defined in claims 35 to 42.

90. Pharmaceutical composition of claim 89, wherein component A is selected from A-1 and A-2; A-1 and A-3; A-2 and A-3; or A-1 and A-2 and A-3.

91. Pharmaceutical composition of claim 89, wherein component A is selected from component A-1.

92. Pharmaceutical composition of any one of the preceding claims, wherein component B is selected from at least one of component

B-1 at least one nucleic acid comprising at least one coding sequence encoding at least one antigenic peptide or protein selected or derived from at least one different Coronavirus or an immunogenic fragment or immunogenic variant thereof, *preferably* as defined in claims 43 to 44, and/or

B-2 at least one nucleic acid comprising at least one coding sequence encoding at least one antigenic peptide or protein selected or derived from at least one Influenza virus or an immunogenic fragment or immunogenic variant thereof, *preferably* as defined in claims 45 to 59, and/or

~~B-3 at least one nucleic acid comprising at least one coding sequence encoding at least one antigenic peptide or protein selected or derived from at least one Pneumoviridae virus or an immunogenic fragment or immunogenic variant thereof, *preferably* as defined in claims 60 to 76, and/or~~

~~B-4 at least one nucleic acid comprising at least one coding sequence encoding at least one antigenic peptide or protein selected or derived from at least one Paramyxoviridae virus or an immunogenic fragment or immunogenic variant thereof, *preferably* as defined in claims 77 to 88.~~

~~93. Pharmaceutical composition of claim 92, wherein component B is selected from B-1 and B-2; B-1 and B-3; B-1 and B-4; B-2 and B-3; B-2 and B-4; or B-3 and B-4.~~

~~94. Pharmaceutical composition of claims 92, wherein the at least one nucleic acid of component B is selected from B-1 and B-2 and B-3; B-1 and B-2 and B-4; B-1 and B-3 and B-4; B-2 and B-3 and B-4.~~

~~95. Pharmaceutical composition of claim 92 to 94 wherein component B-3 is selected from at least one of component~~

~~B-3a at least one nucleic acid comprising at least one coding sequence encoding at least one antigenic peptide or protein selected or derived from at least one RSV or an immunogenic fragment or immunogenic variant thereof, *preferably* as defined in claims 60 to 71, and/or~~

~~B-3b at least one nucleic acid comprising at least one coding sequence encoding at least one antigenic peptide or protein selected or derived from at least one hMPV or an immunogenic fragment or immunogenic variant thereof, *preferably* as defined in claims 72 to 76.~~

~~96. Pharmaceutical composition of claim 95, wherein component B-3 is selected from B-3a.~~

~~97. Pharmaceutical composition of claim 92 to 96, wherein component B-4 is selected from~~

~~B-4a at least one nucleic acid comprising at least one coding sequence encoding at least one antigenic peptide or protein selected or derived from at least one PIV or an immunogenic fragment or immunogenic variant thereof, *preferably* as defined in claims 77 to 82, and/or~~

~~B-4b at least one nucleic acid comprising at least one coding sequence encoding at least one antigenic peptide or protein selected or derived from at least one Henipavirus or an immunogenic fragment or immunogenic variant thereof, *preferably* as defined in claims 83 to 88.~~

~~98. Pharmaceutical composition of claim 97, wherein component B4 is selected from component B-4a.~~

~~99. Pharmaceutical composition of any one of the preceding claims, comprising or consisting of component A-1 and component B-3a.~~

~~100. Pharmaceutical composition of any one of the preceding claims, comprising or consisting of component A-1 and component B-2.~~

~~101. Pharmaceutical composition of any one of the preceding claims, comprising or consisting of component A-1 and component B-2 and component B-3a.~~

~~102. Pharmaceutical composition of any one of the preceding claims, wherein the at least one coding sequence of the nucleic acid of component A and/or the at least one coding sequence of the nucleic acid~~of the mRNA of component B is a codon modified coding sequence, *preferably* wherein the amino acid sequence encoded by the at least one codon modified coding sequence is not being modified compared to the amino acid sequence encoded by the corresponding wild type or reference coding sequence~~.~~.

~~103. Pharmaceutical composition of claim 102,~~ wherein (i) the at least one codon modified coding sequence is preferably selected from C maximized coding sequence, CAI maximized coding sequence, human codon usage adapted coding sequence, G/C content modified coding sequence, and G/C optimized coding sequence, or any combination thereof~~.~~

~~104. Pharmaceutical composition of claim 102~~ and/or

~~103,~~ wherein (ii) the at least one codon modified coding sequence is preferably a G/C optimized coding sequence, a human codon usage adapted coding sequence, or a G/C content modified coding sequence~~.~~

~~105~~10. Pharmaceutical composition of any one of the preceding claims, wherein (iii) the at least one coding sequence of component A and/or the at least one ~~nucleic acid~~mRNA of component B has a G/C content of at least about 50%, 55%, or 60%.

~~106~~11. Pharmaceutical composition of any one of the preceding claims, wherein the at least one ~~nucleic acid~~mRNA of component A and/or the at least one ~~nucleic acid~~mRNA of component B comprises at least one heterologous untranslated region selected from at least one heterologous ~~5'~~5'-UTR and/or at least one heterologous ~~3'-UTR~~3'UTR.

~~107~~12. Pharmaceutical composition of claim ~~106~~11, wherein the at least one heterologous ~~3'~~3'-UTR comprises or consists a nucleic acid sequence derived from a ~~3'~~3'-UTR of a gene selected from PSMB3, ~~ALB7, alpha-globin~~ALB?, alphaglobin, CASP1, COX6B1, GNAS, ~~NDUFA1~~NDUFA 1 and RPS9, or from a homolog, a fragment or a variant of any one of these genes ~~.~~

~~108. Pharmaceutical composition of claim 106~~ and/or

~~107,~~ wherein the at least one heterologous ~~5'~~5'-UTR comprises or consists of a nucleic acid sequence derived from a ~~5'~~5'-UTR of a gene selected from HSD17B4, RPL32, ASAH1, ATP5A1, MP68, NDUFA4, NOSIP, RPL31, SLC7A3, TUBB4B and UBQLN2, or from a homolog, a fragment or variant of any one of these genes.

~~109~~13. Pharmaceutical composition of any one of the preceding claims, wherein the ~~nucleic acid~~mRNA of component A and/or component B comprises at least one coding sequence operably linked to

- an alpha-globin ~~3'~~3'-UTR; or
- a HSD17B4 ~~5'~~5'-UTR and a PSMB3 ~~3'~~3'-UTR (HSD17B4/PSMB3); or
- a SLC7A3 ~~5'~~5'-UTR and a PSMB3 ~~3'~~3'-UTR (SLC7A3/PSMB3); or
- a RPL31 ~~5'~~5'-UTR and a RPS9 ~~3'~~3'-UTR (RPL31/RPS9~~).~~)

~~110. Pharmaceutical composition any one of the preceding claims,~~ and/or

wherein the ~~nucleic acid~~mRNA of component A and/or component B comprises at least one coding sequence operably linked to a ~~HSD17B4 5'~~HSD1784 5'-UTR and a PSMB3 ~~3'~~3'-UTR (HSD17B4/PSMB3).

~~111~~14. Pharmaceutical composition of any one of the preceding claims, wherein the at least one ~~nucleic acid~~mRNA of component A and/or the at least one ~~nucleic acid~~mRNA of component B comprises at least one poly(A) sequence, *preferably* comprising 30 to 200 adenosine nucleotides, *optionally* wherein the at least one ~~nucleic acid~~mRNA of component A and/or the at least one ~~nucleic acid~~mRNA of component B comprises at least one poly(C) sequence, *preferably* comprising 10 to 40 cytosine nucleotides~~.~~

~~112. Pharmaceutical composition of any one of the preceding claims,~~ and/or

wherein the at least one ~~nucleic acid~~mRNA of component A and/or the at least one ~~nucleic acid~~mRNA of component B comprises at least one histone stem-loop or histone stem-loop structure.

~~113~~15. Pharmaceutical composition of any one of the preceding claims, wherein the at least one ~~nucleic acid of component A and/or the at least one nucleic acid of component B is a DNA or an RNA.~~

~~114. Pharmaceutical composition of any one of the preceding claims, wherein the at least one nucleic acid~~mRNA of component A and/or the at least one ~~nucleic acid~~mRNA of component B is a ~~coding RNA, *preferably* an mRNA, a self-replicating RNA, a circular RNA, or a replicon RNA.~~

~~115. Pharmaceutical composition of any one of the preceding claims, wherein the at least one nucleic acid of component A and/or the at least one nucleic acid of component B is an mRNA, *preferably* a~~ purified mRNA~~.~~

~~116. Pharmaceutical composition of any one of the preceding claims,~~ and/or

wherein the at least one ~~nucleic acid~~mRNA of component A and/or the at least one ~~nucleic acid~~mRNA of component B is an RNA, wherein the RNA has an RNA integrity of at least about 50%, preferably of at least about 60%, more preferably of at least about 70%, most preferably of at least about 80%.

~~117~~16. Pharmaceutical composition of any one of the preceding claims, wherein the at least one ~~nucleic acid~~mRNA of component A and/or the at least one ~~nucleic acid~~mRNA of component B comprises a ~~5'~~5'-cap structure, *preferably* m7G, cap0, cap1, cap2, a modified ~~cap0~~capo or a modified cap1 structure.

~~118~~17. Pharmaceutical composition of any one of the preceding claims, wherein the at least one ~~nucleic acid~~mRNA of component A and/or the at least one ~~nucleic acid~~mRNA of component B comprises at least one modified nucleotide~~.~~.

~~119. Pharmaceutical composition of any one of the preceding claims,~~ wherein the at least one ~~nucleic acid~~mRNA of component A and/or the at least one ~~nucleic acid~~mRNA of component B preferably comprises at least one modified nucleotide selected from pseudouridine (Ψ) and N1-methylpseudouridine (m1Ψ), *optionally* wherein all uracil nucleotides are replaced by pseudouridine (Ψ) nucleotides and/or N1-methylpseudouridine (m1Ψ) nucleotides.

~~120. Pharmaceutical composition of claims 1 to 117, wherein the at least one nucleic acid of component A and/or the at least one nucleic acid of component B is an RNA that does not comprise chemically modified nucleotides.~~

~~121. Pharmaceutical composition of claims 1 to 117, wherein the at least one nucleic acid of component A and/or the at least one nucleic acid of component B comprises a coding sequence that consists only of G, C, A and U nucleotides.~~

~~122~~

18. Pharmaceutical composition of any one of the preceding claims, comprising at least one pharmaceutically acceptable carrier.

~~123~~19. Pharmaceutical composition of any one of the preceding claims, wherein the at least one ~~nucleic acid~~mRNA of component A and/or the at least one ~~nucleic acid of component B is complexed or associated with or at least partially complexed or partially associated with one or more cationic or polycationic compound, *preferably* cationic or polycationic polymer, cationic or polycationic polysaccharide, cationic or polycationic lipid, cationic or polycationic protein, cationic or polycationic peptide, or any combinations thereof.~~

~~124. Pharmaceutical composition of any one of the preceding claims, wherein the at least one nucleic acid of component A and/or the at least one nucleic acid of component B is complexed or associated with one or more lipids, thereby forming liposomes, lipid nanoparticles (LNP), lipoplexes, and/or nanoliposomes.~~

~~125. Pharmaceutical composition of any one of the preceding claims, wherein the at least one nucleic acid of component A and/or the at least one nucleic acid of component B is complexed or associated with one or more lipids thereby forming lipid nanoparticles (LNPs).~~

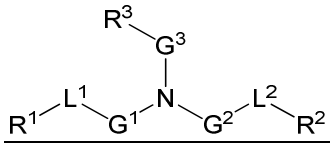
~~126. Pharmaceutical composition of any one of the preceding claims, wherein the at least one nucleic acid of component A and/or the at least one nucleic acid~~mRNA of component B are formulated separately, *preferably* wherein the at least one ~~nucleic acid~~mRNA component A and/or the at least ~~one nucleic~~mRNA acid component B are formulated in separate ~~liposomes,~~ lipid nanoparticles (LNP~~), lipoplexes, and/or nanoliposomes.~~).

~~127. Pharmaceutical composition of any one of the preceding claims,~~ and/or

wherein the at least one ~~nucleic acid~~mRNA of component A and/or the at least one ~~nucleic acid~~mRNA of component B are co-formulated, *preferably* wherein the at least one ~~nucleic~~

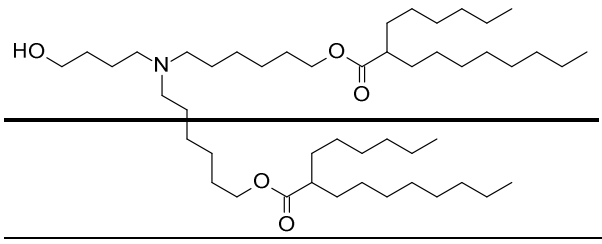
~~acid~~mRNA of component A and/or the at least one ~~nucleic acid~~mRNA of component B are co-formulated in ~~liposomes,~~ lipid nanoparticles (LNP~~), lipoplexes, and/or nanoliposomes.~~).

~~128~~20. Pharmaceutical composition of ~~claim 124 to 127~~any one of the preceding claims, wherein the ~~liposomes,~~LNP comprises at least one cationic lipid according to formula III:



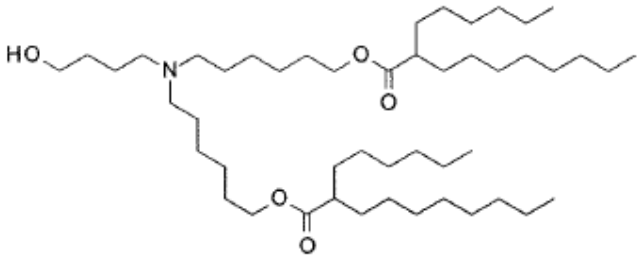
or a pharmaceutically acceptable salt, tautomer, prodrug or stereoisomer thereof, wherein:
L1 or L2 is each independently -O(C=O)-, -(C=O)O-, -C(=O)-, -O-, -S(O)x-, -S-S-, -C(=O)S-, -SC(=O)-, -NRaC(=O)-, -C(=O)NRa-, -NRaC(=O)NRa-, -OC(=O)NRa- or -NRaC(=O)O-, preferably L1 or L2 is -O(C=O)- or -(C=O)O-;
G1 and G2 are each independently unsubstituted C1-C12 alkylene or C1-C12 alkenylene;
G3 is C1-C24 alkylene, C1-C24 alkenylene, C3-C8 cycloalkylene, or C3-C8 cycloalkenylene;
Ra is H or C1-C12 alkyl;
R1 and R2 are each independently C6-C24 alkyl or C6-C24 alkenyl;
R3 is H, OR5, CN, -C(=O)OR4, -OC(=O)R4 or -NR5C(=O)R4;
R4 is C1-C12 alkyl;
R5 is H or C1-C6 alkyl; and
x is 0, 1 or 2.

21. Pharmaceutical composition of any one of the preceding claims, wherein the lipid nanoparticles (LNP~~), lipoplexes, and/or nanoliposomes~~) comprises at least one cationic lipid, *preferably* a cationic lipid according to formula III-3:



~~(III-3)~~

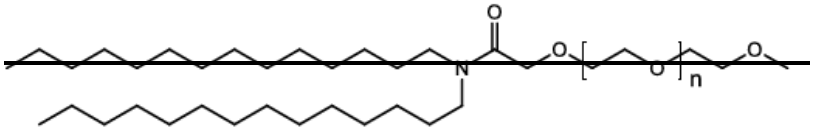
~~129. Pharmaceutical composition of claims 124 to 128,~~



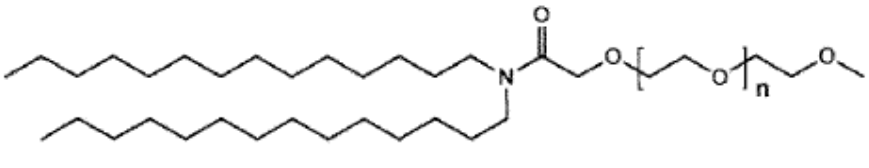
(III-3)

and/or

(1) wherein the ~~liposomes,~~ lipid nanoparticles (LNP~~), lipoplexes, and/or nanoliposomes~~) comprises at least one polymer conjugated lipid, *preferably* a PEG lipid, *preferably* a PEG-lipid according to formula (IVa):



~~(IVa)~~

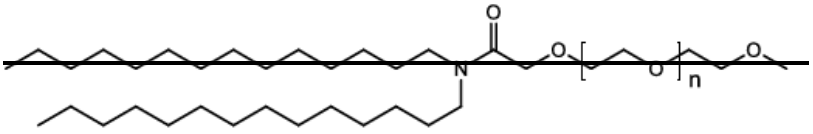


(IVa)

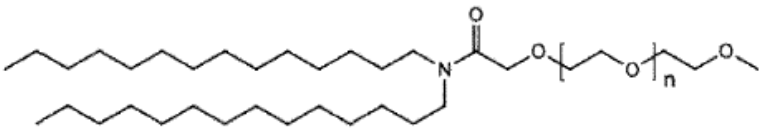
wherein n has a mean value ranging from 30 to 60, *preferably* wherein n has a mean value of about 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, *most preferably* wherein n has a mean value of 49 or 45 .

~~130. Pharmaceutical composition of claims 124 to 128,~~or

(2) wherein the ~~liposomes,~~ lipid nanoparticles (LNP~~), lipoplexes, and/or nanoliposomes~~) comprises at least one polymer conjugated lipid, *preferably* a PEG lipid, *preferably* a PEG-lipid according to formula (IVa):



~~(IVa)~~



(IVa)

wherein n is an integer selected such that the average molecular weight of the PEG lipid is about 2000g/mol to about 3000g/mol or about 2300g/mol to about 2700g/mol, preferably about 2500g/mol.

~~131~~22. Pharmaceutical composition of any one of the preceding claims ~~124 to 130~~, wherein the ~~liposomes,~~ lipid nanoparticles (LNP~~), lipoplexes, and/or nanoliposomes comprises~~) comprise one or more neutral lipids and/or one or more steroid or steroid analogues~~.~~ ,

~~132. Pharmaceutical composition of claim 131,~~ wherein the neutral lipid is preferably 1,2-distearoyl-sn-glycero-3 ~~-~~phosphocholine (DSPC), *more preferably* wherein the molar ratio of the cationic lipid to DSPC is in the range from about 2: 1 to about 8:1~~.~~

~~133. Pharmaceutical composition of claim 131 or 132,~~ and/or

wherein the steroid is preferably cholesterol, *more preferably* wherein the molar ratio of the cationic lipid to cholesterol is in the range from about 2:1 to about 1:1

~~134~~23. Pharmaceutical composition of any one of the preceding claims ~~124 to 133~~, wherein the ~~liposome,~~ lipid nanoparticle (LNP~~), lipoplex, and/or nanoliposome, *preferably* the LNP~~) comprises or consists of

(i) at least one cationic lipid, *preferably* at least one cationic lipid as defined in claim ~~128;~~ 21;

(ii) a neutral lipid, *preferably* a neutral lipid as defined in claim ~~132;~~ 22;

(iii) a steroid or steroid analogue, *preferably* a steroid or steroid analogue as defined in claim ~~133~~22; and

(iv) polymer conjugated lipid, *preferably* a PEG-lipid, e.g. PEG-DMG or PEG-cDMA, *preferably* a PEG-lipid as defined in claim ~~129~~21 (1) or ~~130.~~(2),

~~135. Pharmaceutical composition of claim 134,~~ wherein (i) to (iv) are preferably in a molar ratio of about 20-60% cationic lipid, 5-25% neutral lipid, 25-55% sterol, and 0.5-15% polymer-conjugated lipid, *preferably* PEG-lipid~~.~~

~~136. Pharmaceutical composition of claim 134~~ and/or

~~135,~~ wherein (i) to (iv) are preferably in a molar ratio of about 50:10:38.5:1.5, preferably 47.5:10:40.8:1.7 or more preferably 47.4:10:40.9:1.7.

~~137~~24. Pharmaceutical composition of any of the preceding claims ~~124 to 136~~, wherein the wt/wt ratio of lipid to ~~nucleic acid~~mRNA is from about 10:1 to about 60:1, preferably from about 20:1 to about 30:1, for example about 25:1~~.~~

~~138. Pharmaceutical composition of claims 124 to 137,~~ and/or

wherein the n/p ratio of the ~~liposome,~~ lipid nanoparticle (LNP~~), lipoplex, and/or nanoliposome~~) encapsulating the ~~nucleic acid~~mRNA is in a range from about 1 to about 10, preferably in a range from about 5 to about 7, more preferably about 6~~.~~

~~139. Pharmaceutical composition of claims 124 to 138,~~ and/or

wherein the composition has a polydispersity index (~~PDI~~POI) value of less than about 0.4, preferably of less than about 0.3, more preferably of less than about 0.2, most preferably of less than about 0.1~~.~~

~~140. Pharmaceutical composition of claims 124 to 139,~~ and/or

wherein the LNPs have a Z-average size in a range of about 60nm to about 120nm, preferably less than about 120nm~~.~~

~~141. Pharmaceutical composition of claims 124 to 140,~~ and/or

wherein the composition comprises less than about 20% free (non complexed) RNA, preferably less than about 15% free (non complexed) RNA, more preferably less than about 10% free (non complexed) RNA.

~~142~~25. Pharmaceutical composition of any one of the preceding claims, wherein the composition is a lyophilized composition, a spray-dried composition, or a spray-freeze dried composition, *optionally* comprising at least one pharmaceutically acceptable lyoprotectant~~.~~,

~~143. Pharmaceutical composition of claim 142,~~ wherein the ~~composition the~~ lyophilized or spray-dried composition preferably has a water content of less than about 10%, *preferably* a water content of between about 0.5% and 5%.

~~144~~26. Pharmaceutical composition of any one of the preceding claims, wherein when administered to a subject, the at least one ~~nucleic acid~~mRNA of component A and the at least one ~~nucleic acid~~mRNA of component B are translated into an antigenic peptide or protein suitable for inducing an immune response.

~~145~~27. Pharmaceutical composition of any one of the preceding claims, wherein when administered to a subject, an antigen-specific ~~humoral~~humeral immune responses against the peptide or protein encoded by component A and an antigen-specific humoral immune responses against the peptide or protein encoded by component B is induced in said subject.

~~146~~28. Pharmaceutical composition of any one of the preceding claims, wherein when administered to a subject, an antigen-specific T-cell responses against the peptide or protein encoded by component A and an antigen-specific T-cell responses against the peptide or protein encoded by component B is induced in said subject.

~~147~~29. Pharmaceutical composition of any one of the preceding claims, wherein upon administration to a subject, an antigen-specific B-cell memory against the peptide or protein encoded by component A and an antigen-specific B-cell memory against the peptide or protein encoded by component B is established in said subject.

~~148~~30. A combination vaccine comprising at least one component A and at least one component B as defined in claims 1 to ~~147.~~29,

~~149. A combination vaccine of claim 148,~~ wherein the combination vaccine is preferably against at least one ~~coronavirus, *preferably* SARS-CoV-2, and at least one influenza virus and/or RSV virus.~~

~~150. A combination vaccine of claim 148 to 149, wherein the combination vaccine is against at least one coronavirus, *preferably* SARS-CoV-2,~~ at least one influenza virus, at least one RSV virus, and, optionally, against at least one PIV and/or at least one hMPV.

~~151. Combination vaccine of claim 148 to 150, wherein the combination vaccine elicits antigen-specific immune responses comprising T-cell responses and/or B-cell responses against all encoded antigens provided by the at least one nucleic acid of component A and additionally elicits an antigen-specific immune responses comprising T-cell responses and/or B-cell responses against all encoded antigens provided by the at least one nucleic acid of component B.~~

~~152. Combination vaccine of claim 148 to 151, wherein the vaccine elicits antigen-specific immune responses comprising T-cell responses and/or B-cell responses against all encoded antigens upon administration of a low dose of the vaccine, *preferably* wherein the low dose comprises less than about 20µg nucleic acid.~~

~~153. Combination vaccine of claim 148 to 152, wherein the combination vaccine elicits antigen-specific immune responses in a subject that has an age of about 5 years old or younger.~~

~~154. Combination vaccine of claim 148 to 153, wherein the combination vaccine elicits antigen-specific immune responses in a subject that has an age of about 60 years old or older.~~

~~155~~31. A Kit or kit of parts, comprising at least one pharmaceutical composition of claims 1 to ~~147~~29, and/or at least one combination vaccine of ~~claims 148 to 153~~claim 30, *optionally* comprising at least one liquid vehicle for solubilising, and, *optionally,* technical instructions providing information on administration and dosage of the kit components.

~~156~~32. Pharmaceutical composition of claims 1 to ~~147~~29, combination vaccine of ~~claims 148 to 153, kit or kit of parts of~~ claim ~~155, for use as a medicament.~~

~~157. Pharmaceutical composition of claims 1 to 147, combination vaccine of claims 148 to 153~~30, kit or kit of parts of claim ~~155,~~31, for use as a medicament,

preferably for use in the treatment or prophylaxis of an infection with ~~a coronavirus, *preferably* SARS-CoV-2, and with~~ at least one ~~further~~influenza virus, or of a disorder caused by such an infection

or

preferably ~~wherein said further virus is selected from at least one different Coronavirus, at least one Influenza virus, at least one Pneumoviridae virus, and/or at least one Paramyxoviridae virus.~~

~~158. Pharmaceutical composition of claims 1 to 147, combination vaccine of claims 148 to 153, kit or kit of parts of claim 155,~~ for use in the treatment or prophylaxis of an infection with at least one coronavirus, *preferably* SARS-CoV-2, at least one RSV, and at least one influenza virus, or ~~of~~ a disorder ~~related to~~caused by such an infection~~.~~,

~~159. Pharmaceutical composition of claims 1 to 147, combination vaccine of claims 148 to 153, kit or kit of parts of claim 155,~~ for use in ~~the treatment or prophylaxis of an infection with at least one coronavirus, *preferably* SARS-CoV-2, and at least one RSV, or of a disorder related to such an infection.~~

~~160. Pharmaceutical composition of claims 1 to 147, combination vaccine of claims 148 to 153, kit or kit of parts of claim 155, for use in the treatment or prophylaxis of an infection with at least one coronavirus, *preferably* SARS-CoV-2, at least one RSV, and at least one influenza virus, or a disorder related to such an infection.~~

~~161. A method of~~ treating or preventing a disorder~~, wherein the method comprises applying or administering to a subject in need thereof the pharmaceutical composition of claims 1 to 147, the combination vaccine of claims 148 to 153, or the kit or kit of parts of claim 155.~~

~~162. Method of treating or preventing a disorder of claim 161, wherein the disorder is an infection with a coronavirus, *preferably* SARS-CoV-2, and an infection with at least one further virus, *optionally* wherein said further virus is selected from at least one different Coronavirus, at least one Influenza virus, at least one Pneumoviridae virus, and/or at least one Paramyxoviridae virus, or of a disorder related to these infections.~~

~~163. Method of treating or preventing a disorder of claim 161 or 162~~ caused by such an infection, wherein the subject in need is a mammalian subject, *preferably* a human subject~~.~~

~~164. Method of treating or preventing a disorder of claim 161 or 163, wherein the subject in need is a human subject.~~, *more* *preferably* an elderly human subject~~.~~.

~~165. Method of~~for

for use in treating or preventing a disorder ~~of claim 161 or 164~~caused by an infection with SARS-CoV-2 and at least one influenza virus, wherein the ~~method~~use prevents moderate and severe COVID-19 disease in at least 80%, 85%, 90% or 95% of treated subjects from about 2 weeks to about 3 month, 6 months, 9 months, 1 year, 1.5 years, 2 years or 3 years after said administration and prevents at least one further disease associated with a Coronavirus infection, ~~an Influenza virus infection, a Pneumoviridae virus infection, and/or a Paramyxoviridae~~or an Influenza virus infection.

~~166. Method of~~33. Pharmaceutical composition of claims 1 to 29, combination vaccine of claim 30, kit or kit of parts of claim 31 for use as a medicament in treating or preventing a disorder

~~of claim 161 or 165~~caused by such an infection, wherein the subject is to be administered a single dose that comprises between about ~~5µg~~5µg and about ~~50µg~~50µg of RNA ~~.~~

~~167. Method of~~for

for use in treating or preventing a disorder of ~~claim 161 or 165~~caused by such an infection, wherein the subject is to be administered a two doses that comprise between about ~~5µg~~5µg and about ~~50µg~~50µg of RNA.

~~168~~34. A method of stabilizing a pharmaceutical composition of claims 1 to ~~147~~29 or a combination vaccine of ~~claims 148 to153~~claim 30 comprising lyophilizing the composition or vaccine to produce a stabilized composition or vaccine~~.~~.

~~169. Method of stabilizing of claim 168,~~ wherein the stabilized composition or vaccine has preferably a water content of less than about 10%, preferably a water content of between about 0.5% and 5.0~~%~~%.

~~170. A stabilized, lyophilized composition or vaccine produced by a method of claims 168 to 169.~~