CLAIMS:

1. A lipid nanoparticle ("LNP") composition comprising:

an RNA component; and

a lipid component, wherein the lipid component comprises:

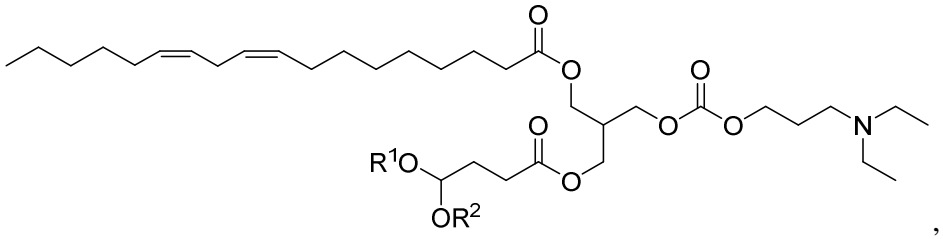
about 50-60 mol-% amine lipid;

about 8-10 mol-% neutral lipid; and

about 2.5-4 mol-% PEG lipid,

wherein the remainder of the lipid component is helper lipid,

the amine lipid is represented by the following structural formula



,

wherein R^1 and R^2 are each independently a C4-C12 alkyl, and

the N/P ratio of the LNP composition is about 6.

2. An LNP composition comprising:

an RNA component;

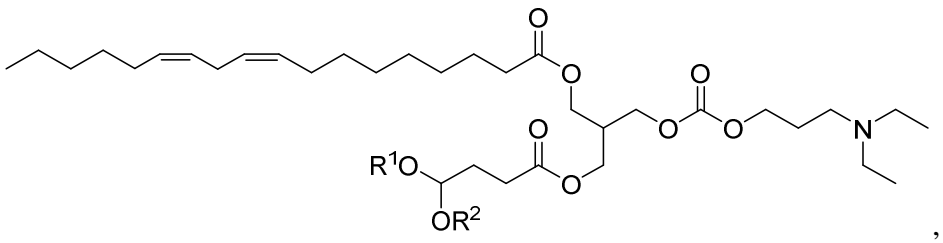
about 50-60 mol-% amine lipid;

about 27-39.5 mol-% helper lipid;

about 8-10 mol-% neutral lipid; and

about 2.5-4 mol-% PEG lipid,

wherein the amine lipid is represented by the following structural formula



,

wherein R^1 and R^2 are each independently a C4-C12 alkyl, and

the N/P ratio of the LNP composition is about 5-7.

3. The LNP composition of claim 2, wherein the N/P ratio is about 6.

4. An LNP composition comprising:

an RNA component; and

a lipid component, wherein the lipid component comprises

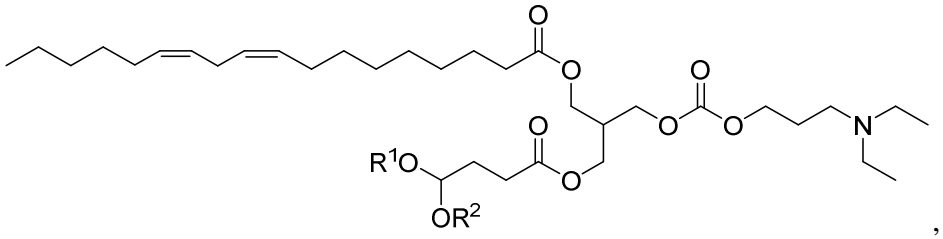
about 50-60 mol-% amine lipid;

about 5-15 mol-% neutral lipid; and

about 2.5-4 mol-% PEG lipid,

wherein the remainder of the lipid component is helper lipid,

the amine lipid is represented by the following structural formula



,

wherein R^1 and R^2 are each independently a C4-C12 alkyl, and

the N/P ratio of the LNP composition is about 3-10.

5. An LNP composition comprising:

an RNA component; and

a lipid component, wherein the lipid component comprises

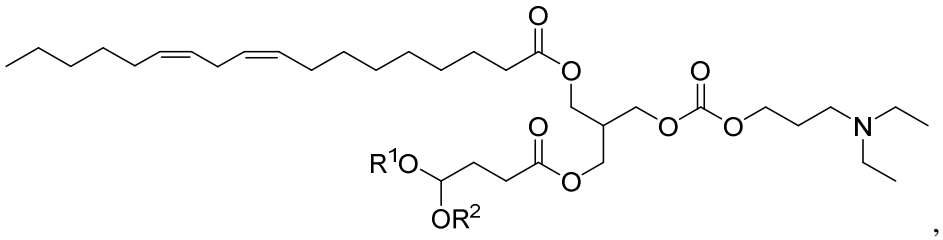
about 40-60 mol-% amine lipid;

about 5-15 mol-% neutral lipid; and

about 2.5-4 mol-% PEG lipid,

wherein the remainder of the lipid component is helper lipid,

the amine lipid is represented by the following structural formula



,

wherein R^1 and R^2 are each independently a C4-C12 alkyl, and

the N/P ratio of the LNP composition is about 6.

6. An LNP composition comprising:

an RNA component; and

a lipid component, wherein the lipid component comprises

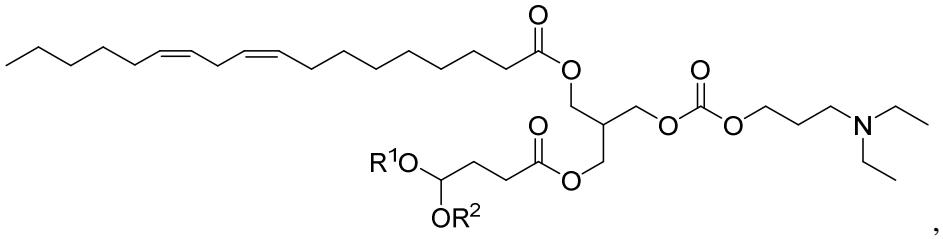
about 50-60 mol-% amine lipid;

about 5-15 mol-% neutral lipid; and

about 1.5-10 mol-% PEG lipid,

wherein the remainder of the lipid component is helper lipid,

the amine lipid is represented by the following structural formula



,

wherein R^1 and R^2 are each independently a C4-C12 alkyl, and

the N/P ratio of the LNP composition is about 6.

7. An LNP composition comprising:

an RNA component; and

a lipid component, wherein the lipid component comprises

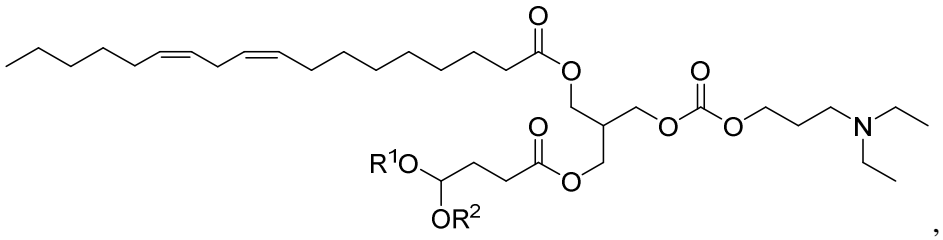
about 40-60 mol-% amine lipid;

about 0-10 mol-% neutral lipid; and

about 1.5-10 mol-% PEG lipid, wherein

the remainder of the lipid component is helper lipid,

the amine lipid is represented by the following structural formula



,

wherein R^1 and R^2 are each independently a C4-C12 alkyl, and

the N/P ratio of the LNP composition is about 3-10.

8. An LNP composition comprising:

an RNA component; and

a lipid component, wherein the lipid component comprises:

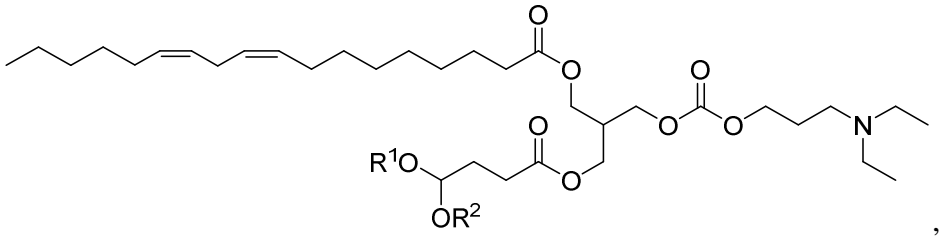
about 40-60 mol-% amine lipid;

less than about 1 mol-% neutral lipid; and

about 1.5-10 mol-% PEG lipid, wherein

the remainder of the lipid component is helper lipid,

the amine lipid is represented by the following structural formula



,

wherein R^1 and R^2 are each independently a C4-C12 alkyl, and

the N/P ratio of the LNP composition is about 3-10.

9. An LNP composition comprising:

an RNA component; and

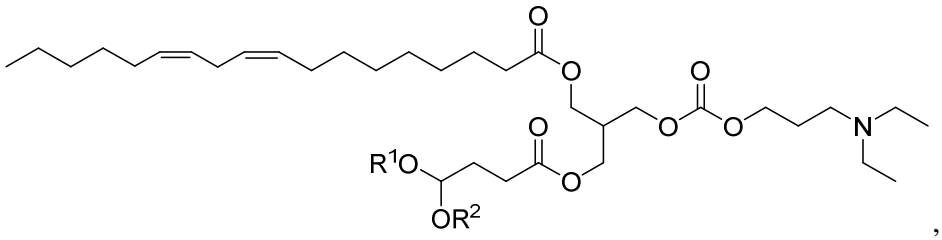
a lipid component, wherein the lipid component comprises:

about 40-60 mol-% amine lipid; and

about 1.5-10 mol-% PEG lipid, wherein

the remainder of the lipid component is helper lipid,

the amine lipid is represented by the following structural formula



,

wherein R^1 and R^2 are each independently a C4-C12 alkyl,

the N/P ratio of the LNP composition is about 3-10, and

the LNP composition is essentially free of or free of neutral phospholipid.

10. An LNP composition comprising:

an RNA component; and

a lipid component, wherein the lipid component comprises:

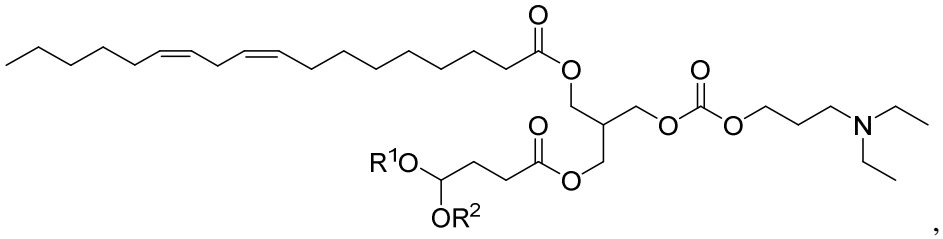
about 50-60 mol-% amine lipid;

about 8-10 mol-% neutral lipid; and

about 2.5-4 mol-% PEG lipid, wherein

the remainder of the lipid component is helper lipid,

the amine lipid is represented by the following structural formula



,

wherein R^1 and R^2 are each independently a C4-C12 alkyl, and

the N/P ratio of the LNP composition is about 3-7.

11. The composition of any one of claims 1-10, wherein the RNA component comprises an mRNA.

12. The composition of any one of claims 1-11, wherein the RNA component encodes an RNA-guided DNA-binding agent.

13. The composition of any one of claims 1-12, wherein the RNA component comprises a Class 2 Cas nuclease mRNA.

14. The composition of any one of claims 1-13, wherein the RNA component comprises a Cas9 nuclease mRNA.

15. The composition of any of claims 11-14, wherein the mRNA is a modified mRNA.

16. The composition of any one of claims 1-15, wherein the RNA component comprises an RNA comprising an open reading frame encoding an RNA-guided DNA-binding agent, wherein the open reading frame has a uridine content ranging from its minimum uridine content to 150% of the minimum uridine content.

17. The composition of any one of claims 1-16, wherein the RNA component comprises an mRNA comprising an open reading frame encoding an RNA-guided DNA-binding agent, wherein the open reading frame has a uridine dinucleotide content ranging from its minimum uridine dinucleotide content to 150% of the minimum uridine dinucleotide content.

18. The composition of any one of claims 1-17, wherein the RNA component comprises an mRNA comprising a sequence with at least 90% identity to any one of SEQ ID NO: 1, 4, 7, 9, 10, 11, 12, 14, 15, 17, 18, 20, 21, 23, 24, 26, 27, 29, 30, 50, 52, 54, 65, or 66, wherein the mRNA comprises an open reading frame encoding an RNA-guided DNA-binding agent.

19. The composition of any one of claims 1-18, wherein the RNA component comprises a gRNA nucleic acid.

20. The composition of claim 19, wherein the gRNA nucleic acid is a gRNA.

21. The composition of any one of claims 1-20, wherein the RNA component comprises a Class 2 Cas nuclease mRNA and a gRNA.

22. The composition of any of claims 19-21, wherein the gRNA nucleic acid is or encodes a dual-guide RNA (dgRNA).

23. The composition of any of claims 19-21, wherein the gRNA nucleic acid is or encodes a single guide RNA (sgRNA).

24. The composition of any of claims 19-23, wherein the gRNA is modified.

25. The composition of claim 24, wherein the gRNA comprises a modification chosen from 2'-O-methyl (2'-O-Me) modified nucleotide, a phosphorothioate (PS) bond between nucleotides; and a 2'-fluoro (2'-F) modified nucleotide.

26. The composition of any of claims 24-25, wherein the gRNA comprises a modification at one or more of the first five nucleotides at the 5' end.

27. The composition of any of claims 24-26, wherein the gRNA comprises a modification at one or more of the last five nucleotides at the 3' end.

28. The composition of any of claims 24-27, wherein the gRNA comprises PS bonds between the first four nucleotides.

29. The composition of any of claims 24-28, wherein the gRNA comprises PS bonds between the last four nucleotides.

30. The composition of any of claims 24-29, further comprising 2'-O-Me modified nucleotides at the first three nucleotides at the 5' end.

31. The composition of any of claims 24-30, further comprising 2'-O-Me modified nucleotides at the last three nucleotides at the 3' end.

32. The composition of any of claims 19-31, wherein the gRNA and Class 2 Cas nuclease mRNA are present in a ratio ranging from about 10:1 to about 1:10 by weight.

33. The composition of any of claims 19-31, wherein the gRNA and Class 2 Cas nuclease mRNA are present in a ratio ranging from about 5:1 to about 1:5 by weight.

34. The composition of any of claims 19-33, wherein the gRNA and Class 2 Cas nuclease mRNA are present in a ratio ranging from about 3:1 to about 1:1 by weight.

35. The composition of any of claims 19-34, wherein the gRNA and Class 2 Cas nuclease mRNA are present in a ratio ranging from about 2:1 to about 1:1 by weight.

36. The composition of any of claims 19-35, wherein the gRNA and Class 2 Cas nuclease mRNA are present in a ratio of about 2:1 by weight

37. The composition of any of claims 19-35, wherein the gRNA and Class 2 Cas nuclease mRNA are present in a ratio of about 1:1 by weight.

38. The composition of any one of claims 1-37, further comprising at least one template.

39. The composition of any one of claims 1-38, wherein the mol-% PEG lipid is about 3.

40. The composition of any one of claims 1-39, wherein the mol-% amine lipid is about 50.

41. The composition of any one of claims 1-40, wherein the mol-% amine lipid is about 55.

42. The composition of any one of claims 1-41, wherein the mol-% amine lipid is ± 3 mol-% of a target mol-% of amine lipid.

43. The composition of any one of claims 1-42, wherein the mol-% amine lipid is ± 2 mol-% of a target mol-% of amine lipid.

44. The composition of any one of claims 1-43, wherein the mol-% amine lipid is 47-53 mol-%.

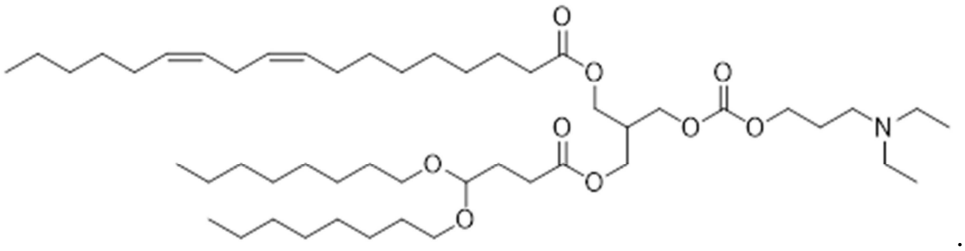
45. The composition of any one of claims 1-44, wherein the mol-% amine lipid is 48-53 mol-%.

46. The composition of any one of claims 1-45, wherein the mol-% amine lipid is 53-57 mol-%.

47. The composition of any one of claims 1-46, wherein the N/P ratio is 6 ± 1.

48. The composition of any one of claims 1-47, wherein the N/P ratio is 6 ± 0.5.

49. The composition of any one of claims 1-48, wherein the amine lipid is Lipid A, wherein Lipid A is represented by the following structural formula:



.

50. The composition of claim 1, wherein R^1 and R^2 is each independently a C5-C12 alkyl.

51. The composition of claim 1, wherein R^1 and R^2 is each independently a C5-C10 alkyl.

52. The composition of claim 1, wherein R^1 and R^2 are each independently chosen from a C4, C5, C6, C7, C8, C9, C10, C11, and C12 alkyl.

53. The composition of any one of claims 1-52, wherein the helper lipid is cholesterol.

54. The composition of any one of claims 1-53, wherein the neutral lipid is DSPC.

55. The composition of any one of claims 1-54, wherein the neutral lipid is DPPC.

56. The composition of any one of claims 1-55, wherein the PEG lipid comprises dimyristoylglycerol (DMG).

57. The composition of any one of claims 1-56, wherein the PEG lipid comprises a PEG-2k.

58. The composition of any one of claims 1-57, wherein the PEG lipid is a PEG-DMG.

59. The composition of claim 58, wherein the PEG-DMG is a PEG2k-DMG.

60. The composition of claim 9, wherein the LNP composition is essentially free of neutral lipid.

61. The composition of claim 60, wherein the neutral lipid is a phospholipid.

62. A method of gene editing, comprising contacting a cell with an LNP composition of any one of claims 21-61.

63. A method of gene editing, comprising delivering a Class 2 Cas nuclease mRNA and a guide RNA nucleic acid to a cell, wherein the Class 2 Cas nuclease mRNA and the guide RNA nucleic acid are formulated as at least one LNP composition of any one of claims 21-61.

64. A method of producing a genetically engineered cell, comprising contacting a cell with at least one LNP composition of any one of claims 21-61.

65. The method of any of claims 62-64, wherein the LNP composition is administered at least two times.

66. The method of claim 65, wherein the LNP composition is administered 2-5 times.

67. The method of claim 65 or 66, wherein editing improves upon readministration.

68. The method of any of claims 62-67, further comprising introducing at least one template nucleic acid to the cell.

69. The method of any of claims 62-68, wherein the mRNA is formulated in a first LNP composition and the guide RNA nucleic acid is formulated in a second LNP composition.

70. The method of claim 69, wherein the first and second LNP compositions are administered simultaneously.

71. The method of claim 69, wherein the first and second LNP compositions are administered sequentially.

72. The method of any of claims 62-70, wherein the mRNA and the guide RNA nucleic acid are formulated in a single LNP composition.

73. The composition of claim 12, wherein the RNA component comprises a Cas nuclease mRNA.