CLAIMS

We claim:

1. A composition comprising an isolated lysophosphatidylcholine (LPC) with a single acyl chain, at least one further lipid, and a TLR7/8 agonist, wherein

the acyl chain is a C13-C22 acyl chain or a C13-C24 acyl chain,

the at least one further lipid is selected from the group consisting of an ionizable lipid, a cationic lipid, a further phospholipid, a pegylated lipid, a structural lipid, and mixtures thereof, and

the LPC and the at least one further lipid are part of a lipid nanoparticle (LNP).

2. A composition comprising an isolated lysophosphatidylcholine (LPC) with a single acyl chain, and at least one further lipid, wherein

the acyl chain is a C21-C24 acyl chain,

the at least one further lipid is selected from the group consisting of an ionizable lipid, a cationic lipid, a further phospholipid, a pegylated lipid, a structural lipid, and mixtures thereof, and

the LPC and the at least one further lipid are part of a lipid nanoparticle (LNP);

the composition further comprising:

a) an antigen; and/or

b) dendritic cells;

and optionally further comprising:

c) a TLR7/8 agonist.

3. A pharmaceutical formulation comprising the composition of claim 1 or claim 2 and a pharmaceutically acceptable excipient.

4. An ex vivo method for production of hyperactivated dendritic cells, the method comprising contacting the dendritic cells with an effective amount of a composition comprising an isolated lysophosphatidylcholine (LPC) with a single C13-C22 acyl chain or a C13-C24 acyl

chain, at least one further lipid, and a TLR7/8 agonist, for production of hyperactivated dendritic cells, wherein

the hyperactivated dendritic cells secrete IL-1beta without undergoing pyroptosis,

the at least one further lipid is selected from the group consisting of an ionizable lipid, a cationic lipid, a further phospholipid, a pegylated lipid, a structural lipid, and mixtures thereof, and

the LPC and the at least one further lipid are part of a lipid nanoparticle (LNP).

5. Use of a composition comprising an isolated lysophosphatidylcholine (LPC) with a single C13-C22 acyl chain or a C13-C24 acyl chain, at least one further lipid, and a TLR7/8 agonist, for production of hyperactivated dendritic cells, wherein

the hyperactivated dendritic cells secrete IL-1beta without undergoing pyroptosis,

the at least one further lipid is selected from the group consisting of an ionizable lipid, a cationic lipid, a further phospholipid, a pegylated lipid, a structural lipid, and mixtures thereof, and

the LPC and the at least one further lipid are part of a lipid nanoparticle (LNP), in the manufacture of a medicament for producing hyperactivated dendritic cells.

6. Use of a formulation, wherein said formulation is the formulation of claim 3:

a) in the manufacture of a medicament for:
   i. stimulating an immune response against an antigen, in an individual in need thereof; or

   ii. treating cancer, in an individual in need thereof; or

   iii. inhibiting abnormal cell proliferation in an individual in need thereof; or

   iv. treating an infectious disease in an individual in need thereof;

   or

b) in the manufacture of a medicament for:

i) inducing an immune response against the antigen in an individual in need thereof; or

ii) inducing an anti-tumor immune response in an individual in need thereof, wherein the individual is or was tumor-bearing; or

iii) inducing an anti-microbe immune response in an individual in need thereof, wherein the individual is infected with the microbe or has not been exposed to the microbe.

7. A method of preparing an immunogenic composition, the method comprising:

a) obtaining a tumor cell-enriched suspension from a tumor;

b) lysing cells from the tumor cell-enriched suspension to obtain a tumor cell lysate; and

c) contacting the tumor cell lysate with a composition comprising an isolated lysophosphatidylcholine (LPC) having a single acyl chain, at least one further lipid, and a toll-like receptor 7/8 (TLR7/8) agonist, to obtain the immunogenic composition, wherein

the acyl chain is a C13-C22 acyl chain or a C13-C24 acyl chain,

the at least one further lipid is selected from the group consisting of an ionizable lipid, a cationic lipid, a further phospholipid, a pegylated lipid, a structural lipid, and mixtures thereof, and

the LPC and the at least one further lipid are part of a lipid nanoparticle (LNP).

8. An immunogenic composition prepared by the method of claim 7.

9. Use of an immunogenic composition of claim 8 in the manufacture of a medicament for eliciting an anti-cancer immune response, in a mammalian subject with cancer.

10. Use of an immunogenic composition in the manufacture of a medicament for treating cancer, comprising:

preparing said immunogenic composition comprising a tumor cell lysate, an isolated lysophosphatidylcholine (LPC) having a single acyl chain, at least one further lipid, and a toll-like receptor 7/8 (TLR7/8) agonist, wherein

the tumor cell lysate is or has been prepared from a sample of a tumor obtained from the mammalian subject with cancer,

the acyl chain is a C13-C22 acyl chain or a C13-C24 acyl chain,

the at least one further lipid is selected from the group consisting of an ionizable lipid, a cationic lipid, a further phospholipid, a pegylated lipid, a structural lipid, and mixtures thereof, and

the LPC and the at least one further lipid are part of a lipid nanoparticle (LNP).

11. Use of a pharmaceutical formulation comprising an isolated lysophosphatidylcholine (LPC) with a single acyl chain, at least one further lipid, and a pharmaceutically acceptable excipient, wherein

the acyl chain is a C21-C24 acyl chain,

the at least one further lipid is selected from the group consisting of an ionizable lipid, a cationic lipid, a further phospholipid, a pegylated lipid, a structural lipid, and mixtures thereof, and

the LPC and the at least one further lipid are part of a lipid nanoparticle (LNP), in the manufacture of a medicament for stimulating an immune response in an individual.

12. Use of a composition comprising a lipid nanoparticle (LNP), wherein the LNP comprises a first phospholipid, and at least one lipid selected from the group consisting of an ionizable lipid, a second phospholipid, a pegylated lipid, a structural lipid, and mixtures thereof, wherein the first phospholipid comprises a lysophosphatidylcholine (LPC) with a single acyl chain, and the acyl chain is a C13-C24 acyl chain, in the manufacture of a medicament for stimulating an immune response in an individual.

13. The use according to claim 12, wherein the LNP comprises a first phospholipid, an ionizable lipid, a second phospholipid, a pegylated lipid, and a structural lipid, wherein the first phospholipid comprises a lysophosphatidylcholine (LPC) with a single acyl chain, and the acyl chain is a C13-C24 acyl chain.

14. The composition, or formulation, or method, or use of any one of claims 1-13, wherein

a) the ionizable lipid comprises:

i) 8-[(2-hydroxyethyl)[6-oxo-6-(undecyloxy)hexyl]amino]-octanoic acid, 1-octylnonyl ester (SM-102) or analogs or derivatives thereof; and/or 6-((2-hexyldecanoyl)oxy)-N-(6-((2-hexyldecanoyl)oxy)hexyl)-N-(4-hydroxybutyl)hexan-1-aminium (ALC-0315) or analogs or derivatives thereof; or

ii) (6Z,9Z,28Z,31Z)-heptatriaconta-6,9,28,31-tetraen-19-yl 4-(dimethylamino)butanoate (DLin-MC3-DMA) or analogs or derivatives thereof;

and/or

b) the pegylated lipid:

i) is selected from the group consisting of a PEG-modified phosphatidyiethanolamine, a PEG-modified phosphatide acid, a PEG-modified ceramide, a PEG-modified dialkylamine, a PEG-modified diacylglycerol, a PEG-modified dialkylglyerol, and combinations thereof; or

ii) comprises polyethylene glycol [PEG] 2000 dimyristoyl glycerol [DMG];

and/or

c) the structural lipid:

i) is selected from the group consisting of cholesterol, fecosterol, sitosterol, ergosterol, campesterol, stigmasterol, brassicasterol, tomatidine, ursolic acid, alpha-tocopherol, and combinations thereof; or

ii) comprises cholesterol;

and/or

d) the further phospholipid or the second phospholipid:

i) comprises a hydrophilic head moiety selected from the group consisting of phosphatidyl choline, phosphatidyl ethanolamine, phosphatidyl glycerol, phosphatidyl serine, phosphatidic acid, 2-lysophosphatidyl choline, and sphingomyelin; or

ii) comprises one or more fatty acid tail moieties selected from the group consisting of lauric acid, myristic acid, myristoleic acid, palmitic acid, palmitoleic acid, stearic acid, oleic acid, linoleic acid, alpha-linolenic acid, erucic acid, arachidic acid, arachidonic acid, phytanoic acid, eicosapentaenoic acid, behenic acid, docosapentaenoic acid, and docosahexaenoic acid; or

iii) is selected from the group consisting of
1,2-dilinoleoyl-sn-glycero-3-phosphocholine (DLPC),
1,2-dimyristoyl-sn-glycero-phosphocholine (DMPC),
1,2-dioleoyl-sn-glycero-3-phosphocholine (DOPC),
1,2-dipalmitoyl-sn-glycero-3-phosphocholine (DPPC),
1,2-distearoyl-sn-glycero-3-phosphocholine (DSPC),
1,2-diundecanoyl-sn-glycero-phosphocholine (DUPC),
1-palmitoyl-2-oleoyl-sn-glycero-3-phosphocholine (POPC),
1,2-di-O-octadecenyl-sn-glycero-3-phosphocholine,
1-oleoyl-2-cholesterylhemisuccinoyl-sn-glycero-3-phosphocholine,
1,2-dilinolenoyl-sn-glycero-3-phosphocholine,
1,2-diarachidonoyl-sn-glycero-3-phosphocholine,
1,2-didocosahexaenoyl-sn-glycero-3-phosphocholine,
1,2-dioleoyl-sn-glycero-3-phosphoethanola mine (DOPE),
1,2-diphytanoyl-sn-glycero-3-phosphoethanolamine,
1,2-distearoyl-sn-glycero-3-phosphoethanolamine,
1,2-dilinoleoyl-sn-glycero-3-phosphoethanolamine,
1,2-dilinolenoyl-sn-glycero-3-phosphoethanolamine,
1,2-diarachidonoyl-sn-glycero-3-phosphoethanolamine,
1,2-didocosahexaenoyl-sn-glycero-3-phosphoethanolamine,
1,2-dioleoyl-sn-glycero-3-phospho-rac-(1 -glycerol) sodium salt (DOPG),

sphingomyelin, and
combinations thereof; or

iv) comprises 1,2-distearoyl-sn-glycero-3-phosphocholine (DSPC).

15. The composition, or formulation, or method, or use of any one of claims 1-14, wherein:

a) the acyl chain of the LPC is:
   i. a C21-C24 acyl chain; or
   ii. a C22 acyl chain;

and/or

b) acyl chain is fully saturated;

and/or

c) the composition further comprises a TLR7/8 agonist, optionally wherein the TLR7/8 agonist comprises an imidazoquinoline compound, further optionally wherein the TLR7/8 agonist comprises resiquimod (R848).