CLAIMS

1. A lipid nanoparticle (LNP) comprising:

- an ionizable lipid;
- a phospholipid;
- a sterol;
- a PEG lipid; and
- one or more mRNA molecules;

characterized in that

- said PEG lipid is a C14-PEG lipid;
- said LNP comprises between 0.5 – 0.9 mol% of said PEG lipid;
- the molar percentage of said ionizable lipid is between 55 – 60 mol%;
- the molar percentage of said phospholipid is between 5 - 10 mol%; and
- the molar percentage of said sterol is between 25 – 39.5 mol%.

2. A lipid nanoparticle (LNP) as defined in claim 1 comprising:

- an ionizable lipid;
- a phospholipid;
- a sterol;
- a PEG lipid; and
- one or more mRNA molecules;

characterized in that

- said PEG lipid is a C14-PEG lipid;
- said LNP comprises less than 0.5 – 0.9 mol% of said PEG lipid;
- the molar percentage of said ionizable lipid is between 55 – 60 mol%;
- the molar percentage of said phospholipid is between 5 -10 mol%; and
- the molar percentage of said sterol is between 30 – 39.5 mol%.

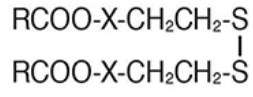
3. A lipid nanoparticle as defined in anyone of claims 1 to 2; wherein the ratio of ionizable lipid to phospholipid is above 5:1; preferably between 6:1 and 11:1; most preferably 11:1.

4. A lipid nanoparticle as defined in anyone of claims 1 to 3; wherein said C14-PEG lipid is a C14-PEG2000 lipid, preferably selected from the list comprising DMG-PEG2000 and DMPE-PEG2000, most preferably DMG-PEG2000.

5. A lipid nanoparticle as defined in anyone of claims 1 to 4; wherein said ionizable lipid is selected from the list comprising:

- 1,1‘-((2-(4-(2-((2-(bis(2-hydroxydodecyl)amino)ethyl)(2-hydroxydodecyl)amino)ethyl) piperazin-1-yl)ethyl)azanediyl)bis(dodecan-2-ol) (C12-200);
- dilinoleylmethyl-4-dimethylaminobutyrate (DLin-MC3-DMA); or

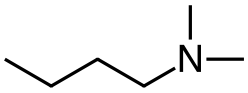
- a compound of formula (I):



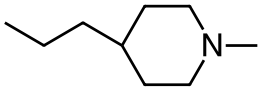
(I)

wherein:

RCOO is selected from the list comprising: myristoyl, α-D-Tocopherolsuccinoyl, linoleoyl and oleoyl; and X is selected from the list comprising:

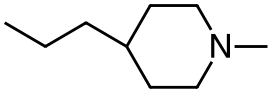


and



;

preferably, said ionizable lipid is a lipid of formula (I) wherein RCOO is α-D-Tocopherolsuccinoyl and X is



6. A lipid nanoparticle as defined in anyone of claims 1 to 5; wherein said phospholipid is selected from the list comprising: DOPE, DOPC, DSPC and mixtures thereof; in particular DOPE, DOPC and mixtures thereof.

7. A lipid nanoparticle as defined in anyone of claims 1 to 6; wherein said sterol is selected from the list comprising cholesterol, ergosterol, campesterol, oxysterol, antrosterol, desmosterol, nicasterol, sitosterol and stigmasterol; preferably cholesterol.

8. A lipid nanoparticle as defined in anyone of claims 1 to 7; wherein said LNP comprises:

- 56.5 mol% of said ionizable lipid;
- 5 mol% of DOPE;
- 38 mol% of cholesterol; and
- 0.5 mol% of DMG-PEG2000.

9. A lipid nanoparticle; wherein said LNP comprises:

- 65 mol% of said ionizable lipid;
- 9.5 mol% of DOPE;
- 25 mol% of cholesterol; and
- 0.5 mol% of DMG-PEG2000.

10. A lipid nanoparticle as defined in anyone of claims 1 to 9; wherein said one or more mRNA molecules are selected from the group of immunomodulatory polypeptide-encoding mRNA, such as selected from mRNA molecules encoding for CD40L, CD70 and caTLR4; and/or antigen-encoding mRNA.

11. A pharmaceutical composition or a vaccine comprising one or more lipid nanoparticles as defined in anyone of claims 1 to 10 and an acceptable pharmaceutical carrier.

12. A lipid nanoparticle as defined in anyone of claims 1 to 10 or a pharmaceutical composition or a vaccine as defined in claim 11 for use in human or veterinary medicine.

13. A lipid nanoparticle as defined in anyone of claims 1 to 10 or a pharmaceutical composition or a vaccine as defined in claim 11 for use in the treatment of cancer or infectious diseases.