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

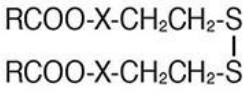
- said PEG lipid is a C14-PEG lipid;
- said LNP comprises between 0.5 – 0.9 mol% of said PEG lipid;
- the molar percentage of said ionizable lipid is between 55 – 60 mol%;
- the molar percentage of said phospholipid is between 5 - 8 mol%;
- the molar percentage of said sterol is calculated as 100 mol% minus the mol% of phospholipid minus the mol % of PEG lipid minus
- the mol % of ionizable lipid; and
- the ratio of ionizable lipid to phospholipid is between 6:1 and 11:1.

2. A lipid nanoparticle as defined in claim 1; wherein the ratio of ionizable lipid to phospholipid is 11:1.

3. A lipid nanoparticle as defined in any one of claims 1 to 2; wherein said C14-PEG lipid is a C14PEG2000 lipid, preferably selected from the list comprising DMG-PEG2000 and DMPE-PEG2000, most preferably DMG-PEG2000.

4. A lipid nanoparticle as defined in any one of claims 1 to 3; wherein said ionizable lipid is selected from the list comprising:

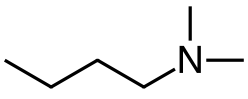
- 1,1‘-((2-(4-(2-((2-(bis(2-hydroxydodecyl)amino)ethyl)(2 hydroxydodecyl)amino)ethyl) piperazin-1yl)ethyl)azanediyl)bis(dodecan-2-ol) (C12-200);
- dilinoleylmethyl-4-dimethylaminobutyrate (DLin-MC3-DMA); or
- a compound of formula (I):



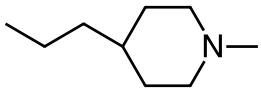
(I)

wherein:

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

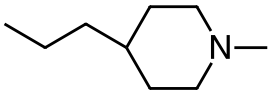


and



;

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



5. A lipid nanoparticle as defined in any one of claims 1 to 4; wherein said phospholipid is selected from the list comprising: DOPE, DOPC, DSPC and mixtures thereof; in particular DOPE, DOPC and mixtures thereof.

6. A lipid nanoparticle as defined in any one of claims 1 to 5; wherein said sterol is selected from the list comprising cholesterol, ergosterol, campesterol, oxysterol, antrosterol, desmosterol, nicasterol, sitosterol and stigmasterol; preferably cholesterol.

7. A lipid nanoparticle as defined in any one of claims 1 to 6; 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.

8. A lipid nanoparticle; wherein said LNP comprises:

- 56.5 mol% of said ionizable lipid;
- 5.25 mol% of DOPE;
- 37.75 mol% of cholesterol; and

- 0.5 mol% of DMG-PEG2000.

9. A lipid nanoparticle as defined in any one of claims 1 to 8; 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.

10. A pharmaceutical composition or a vaccine comprising one or more lipid nanoparticles as defined in any one of claims 1 to 9 and an acceptable pharmaceutical carrier.

11. A lipid nanoparticle as defined in any one of claims 1 to 9 or a pharmaceutical composition or a vaccine as defined in claim 10 for use in human or veterinary medicine.

12. A lipid nanoparticle as defined in any one of claims 1 to 9 or a pharmaceutical composition or a vaccine as defined in claim 10 for use in the treatment of cancer or infectious diseases.