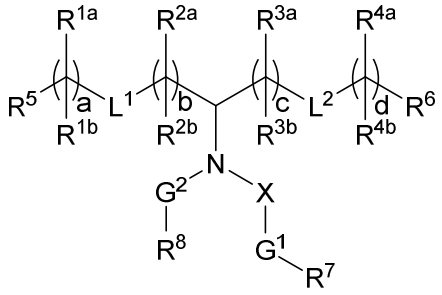
CLAIMS

1. A compound having a structure of Formula (I):



(I)

or a pharmaceutically acceptable salt, tautomer or stereoisomer thereof, wherein:

G^1 and G^2 are each independently C_1-C_6 alkylene;

L^1 and L^2 are each independently -O(C=O)- or -(C=O)O-;

R^{1a} and R^{1b} are, at each occurrence, independently either: (a) H or C_1-C_{12} alkyl; or (b) R^{1a} is H or C_1-C_{12} alkyl, and R^{1b} together with the carbon atom to which it is bound is taken together with an adjacent R^{1b} and the carbon atom to which it is bound to form a carbon-carbon double bond;

R^{2a} and R^{2b} are, at each occurrence, independently either: (a) H or C_1-C_{12} alkyl; or (b) R^{2a} is H or C_1-C_{12} alkyl, and R^{2b} together with the carbon atom to which it is bound is taken together with an adjacent R^{2b} and the carbon atom to which it is bound to form a carbon-carbon double bond;

R^{3a} and R^{3b} are, at each occurrence, independently either (a): H or C_1-C_{12} alkyl; or (b) R^{3a} is H or C_1-C_{12} alkyl, and R^{3b} together with the carbon atom to which it is bound is taken together with an adjacent R^{3b} and the carbon atom to which it is bound to form a carbon-carbon double bond;

R^{4a} and R^{4b} are, at each occurrence, independently either: (a) H or C_1-C_{12} alkyl; or (b) R^{4a} is H or C_1-C_{12} alkyl, and R^{4b} together with the carbon atom to which it is bound is taken together with an adjacent R^{4b} and the carbon atom to which it is bound to form a carbon-carbon double bond;

R^5 and R^6 are each independently H or methyl;

R^7 is -O(C=O)R^{10}, -(C=O)OR^{10}, -NR^9(C=O)R^{10} or -(C=O)NR^9R^{10};

R^8 is OH, -N(R^{11})(C=O)R^{12}, -(C=O)N$R^{11}R^{12}$, -N$R^{11}R^{12}$, -(C=O)OR^{12} or -O(C=O)R^{12};

R^9 is H or C_1-C_{15} alkyl;

R^{10} is C_1-C_{15} alkyl;

R^{11} is H or C_1-C_6 alkyl;

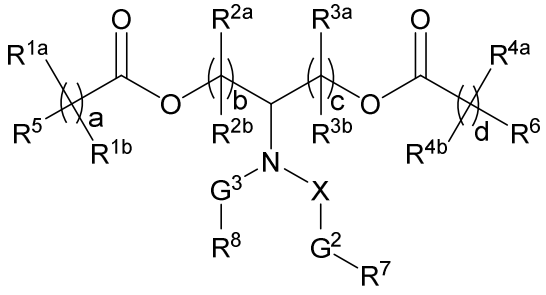
R^{12} is C_1-C_6 alkyl;

X is -(C=O)- or a direct bond; and

a, b, c and d are each independently an integer from 1 to 24;

wherein each alkyl and alkylene is independently optionally substituted with one or more halo, preferably fluoro.

2. The compound of claim 1, having one of the following structures (IA) or (IB):



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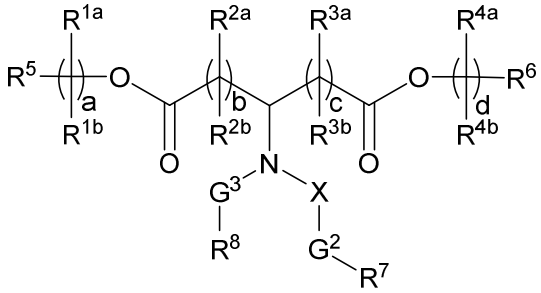


(IA) (IB)

or a pharmaceutically acceptable salt, tautomer or stereoisomer thereof.

3. The compound of claim 1 or 2, wherein G^1 is C_2-C_3 alkylene or C_4-C_6 alkylene.

4. The compound of any one of claims 1-3, wherein G^2 is C_2-C_4 alkylene, C_2-C_3 alkylene or C_3-C_4 alkylene.

5. The compound of any one of claims 1-4, wherein R^7 is -O(C=O)R^{10} or -(C=O)OR^{10}, preferably wherein:

i) R^{10} is linear C_1-C_{15} alkyl;

ii) R^{10} is linear C_6-C_{10} alkyl;

iii) R^{10} is methyl;

iv) R^{10} is branched C_2-C_{15} alkyl; or

v) R^{10} is branched C_{10}-C_{15} alkyl.

6. The compound of any one of claims 1-4, wherein R^7 is $-NR^9(C=O)$ or $-(C=O)NR^9R^{10}$, preferably wherein:

i) R^9 is H; or

ii) R^9 and R^{10} are each independently C_6-C_{10} alkyl.

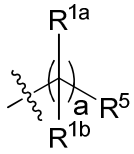
7. The compound of any one of claims 1-6, wherein R^{1a}, R^{1b}, R^{2a}, R^{2b}, R^{3a}, R^{3b}, R^{4a} and R^{4b} are, at each occurrence, independently H or C_1-C_{12} alkyl, preferably wherein:

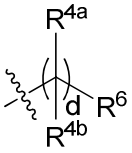
i) R^{2a}, R^{2b}, R^{3a} and R^{3b} are, at each occurrence, H;

ii) R^{1a} and R^{4a} are, at each occurrence, H;

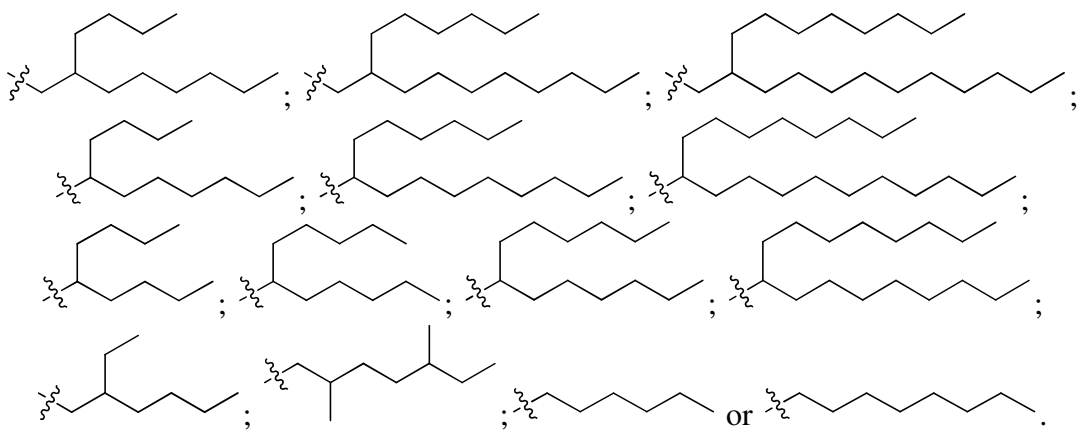
iii) at least one of R^{1b} and R^{4b} is C_1-C_8 alkyl;

iv) C_1-C_8 alkyl is methyl, ethyl, n-propyl, iso-propyl, n-butyl, iso-butyl, tert-butyl, n-hexyl or n-octyl; or

v) 

or 

, or both, independently has one of the following structures: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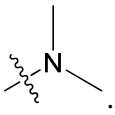
; or .

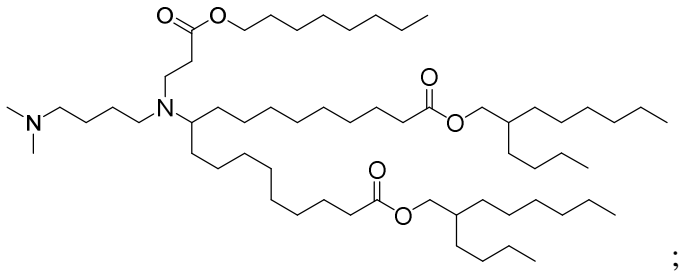
8. The compound of any one of claims 1-7, wherein a, b, c and d are each independently an integer from 2 to 12, preferably wherein a, b, c and d are each independently an integer from 4 to 10, 5 to 10, 6 to 10, 4 to 9, 5 to 9 or 6 to 9.

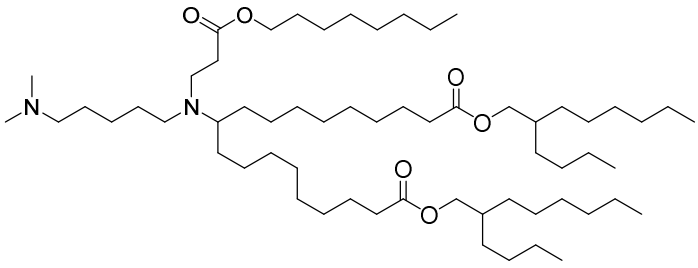
9. The compound of any one of claims 1-8, wherein one of R^5 or R^6 is methyl, preferably wherein each of R^5 and R^6 is methyl.

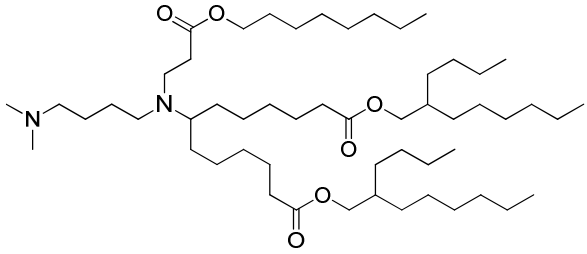
10. The compound of any one of claims 1-9, wherein R^8 has one of the following structures:

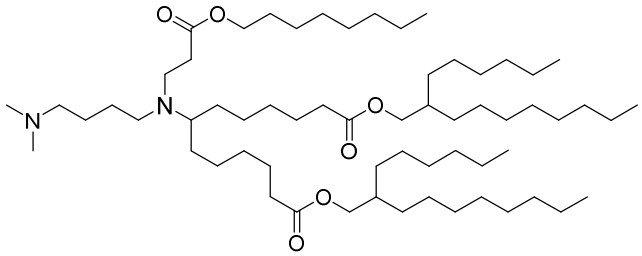
-OH or .

11. The compound of claim 1, having one of the following structures:

;

;

;



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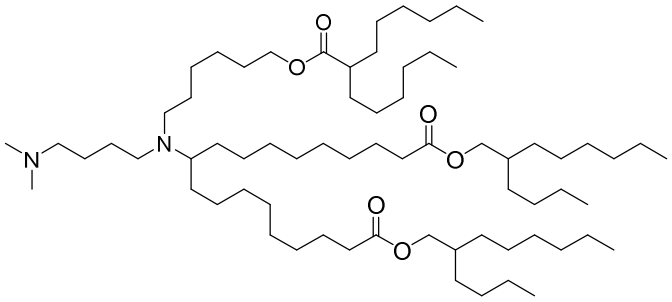

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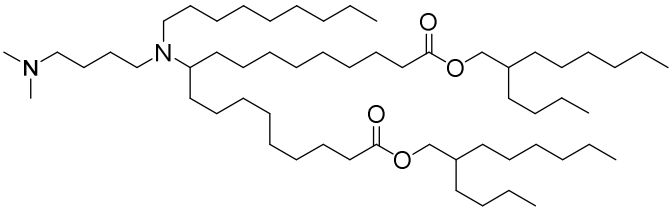

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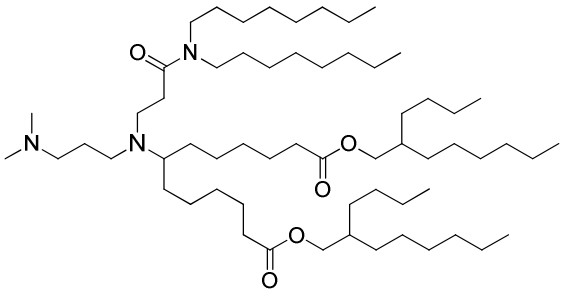

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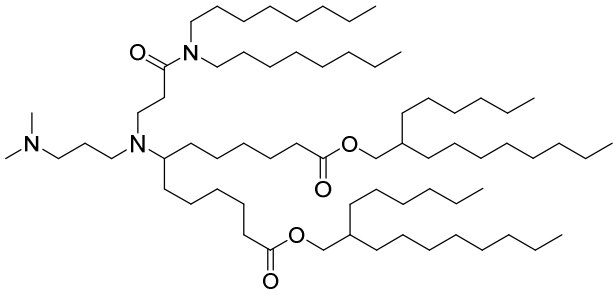

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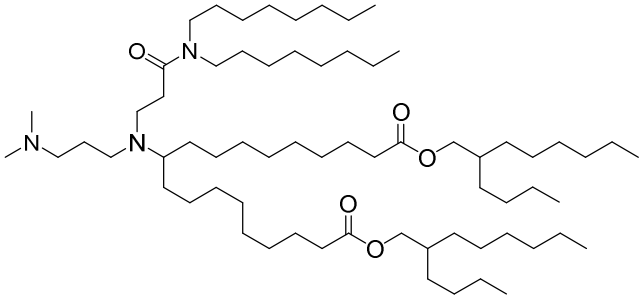

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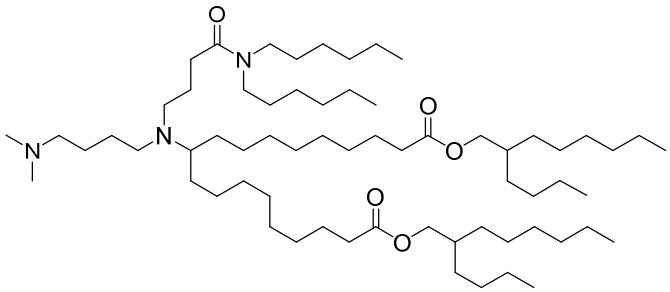

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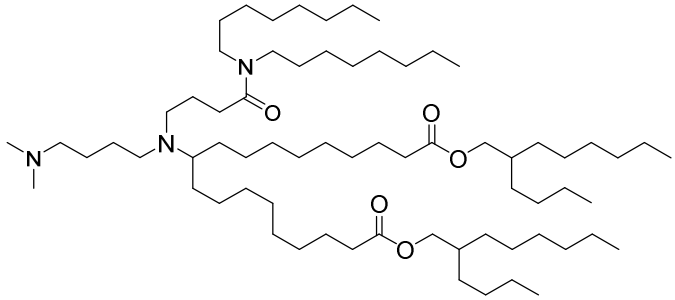

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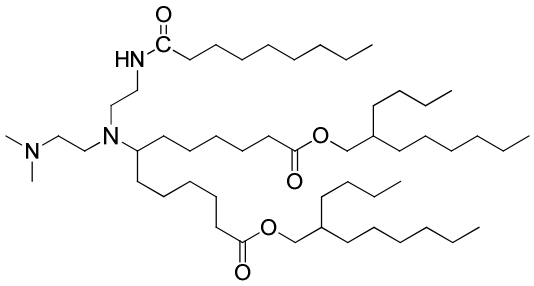

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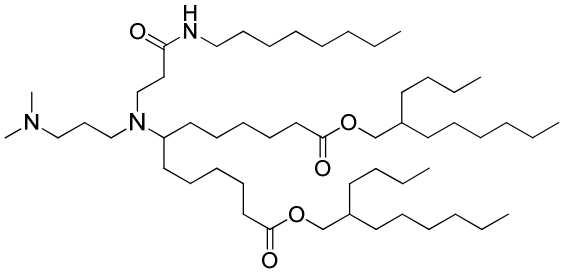

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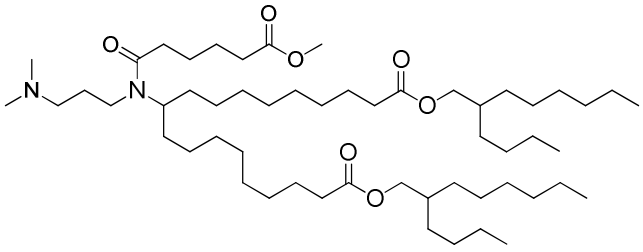

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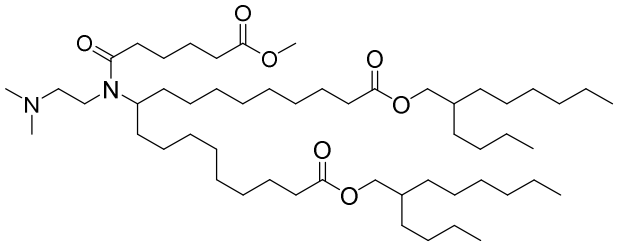

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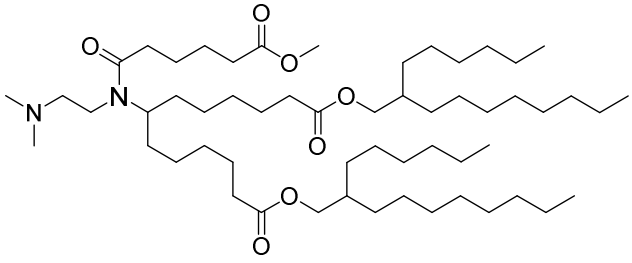

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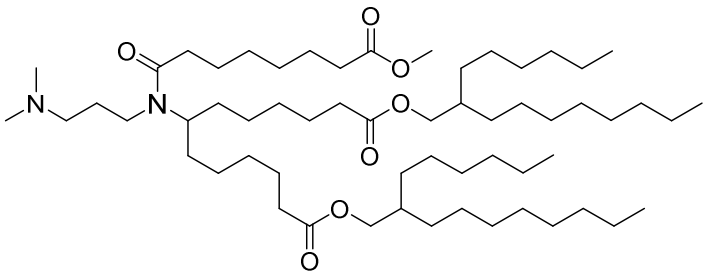

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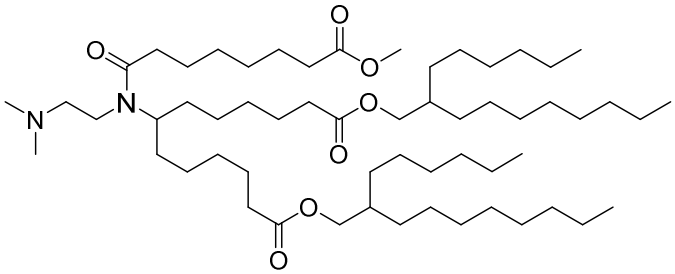

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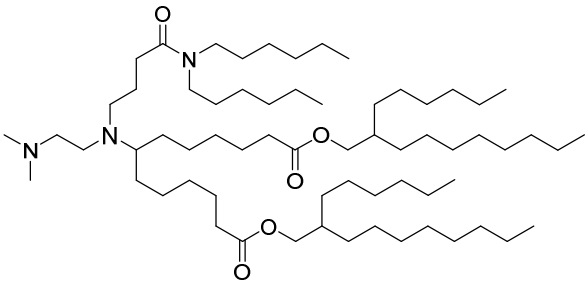

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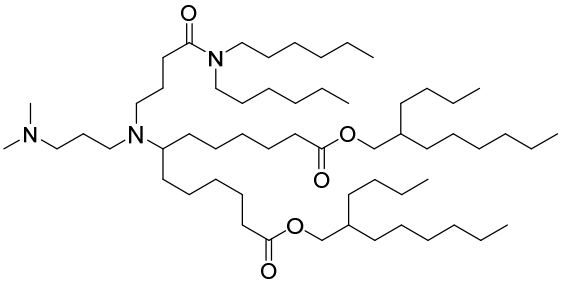

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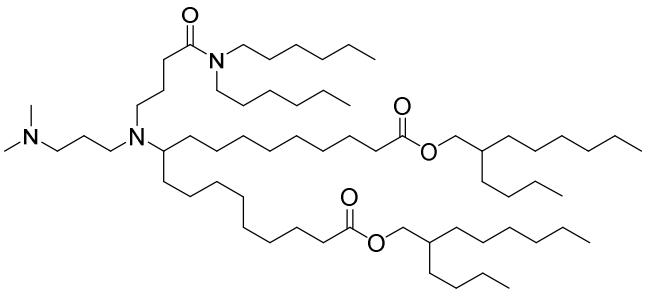

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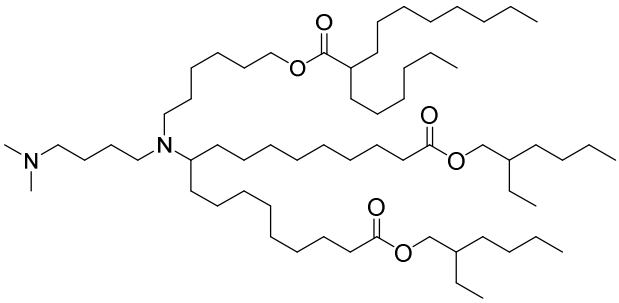

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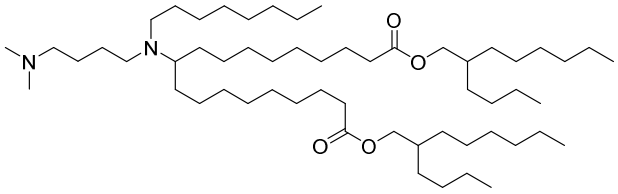

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12. A lipid nanoparticle comprising the compound of any one of claims 1-11 and a therapeutic agent.

13. The lipid nanoparticle of claim 12, wherein the therapeutic agent comprises a nucleic acid, preferably wherein the nucleic acid is selected from antisense and messenger RNA.

14. A pharmaceutical composition comprising the lipid nanoparticle of any one of claims 12 or 13, and a pharmaceutically acceptable diluent or excipient.

15. Use of the lipid nanoparticle of any one of claims 12 or 13, or the pharmaceutical composition of claim 14, in the manufacture of a medicament for inducing expression of a therapeutic protein in a patient in need thereof.

16. Use of the lipid nanoparticle of any one of claims 12 or 13, or the pharmaceutical composition of claim 14, in the manufacture of a medicament for vaccinating a patient in need thereof against a viral pathogen, wherein the therapeutic agent is a viral antigen or a nucleic acid capable of transcribing a viral antigen.