CLAIMS

1. A capsid-free closed ended DNA (ceDNA) vector comprising at least one nucleic acid sequence positioned between flanking inverted terminal (ITRs), wherein the at least one nucleic acid sequence encodes an antigen, or an immunogenic peptide.

2. The ceDNA vector of claim 1, wherein:
the antigen, or the immunogenic peptide, is derived from a bacterial, a viral, a fungal or a parasitic infectious agent;
the antigen, or the immunogenic peptide, is a tumor associated antigen;
the antigen, or the immunogenic peptide, is associated with an autoimmune condition; and/or
the antigen, or the immunogenic peptide, is selected from the group consisting of: one or more of the antigens or the immunogenic peptides set forth in Tables 1-7.

3. The ceDNA vector of any one of claims 1-2, comprising:
a promoter sequence linked to the at least one nucleic acid sequence;
at least one poly A sequence;
a 5' UTR and/or intron sequence;
a 3' UTR sequence; and/or
an enhancer sequence.

4. The ceDNA vector of any one of claims 1-6, wherein at least one of the flanking ITRs comprises a functional terminal resolution site and a Rep binding site.

5. The ceDNA vector of any one of claims 1-4, wherein one or both of the flanking ITRs are derived from a virus selected from the group consisting of: a *Parvovirus*, a *Dependovirus*, and an adeno-associated virus (AAV).

6. The ceDNA vector of any one of claims 1-12, wherein:
the flanking ITRs are symmetric or asymmetric with respect to each other;
the flanking ITRs are substantially symmetric;
the flanking ITRs are asymmetric with respect to each other;
one of the flanking ITRs is a wild-type ITR, or wherein both of the flanking ITRs are wild-type ITRs;
one of the flanking ITRs is not a wild-type ITR, or wherein both of the flanking ITRs are not wild-type ITRs;
the flanking ITRs are derived from different viral serotypes;

the flanking ITRs comprise a pair of viral serotypes selected from the group consisting of: the pairs of viral serotypes set forth in Table 8;
one or both of the flanking ITRs comprise a sequence selected from the group consisting of: one or more of the sequences set forth in Table 9; and/or
one or both of the flanking ITRs are derived from an AAV serotype selected from the group consisting of: AAV1, AAV2, AAV3, AAV4, AAV5, AAV6, AAV7, AAV8, AAV9, AAV10, AAV11, and AAV12.

7. The ceDNA vector of any one of claims 1-6, wherein at least one of the flanking ITRs is altered from a wild-type AAV ITR sequence by a deletion, an addition, and/or a substitution that affects the overall three-dimensional conformation of the ITR.

8. The ceDNA vector of any one of claims 1-7, wherein one or both of the flanking ITRs are synthetic.

9. The ceDNA vector of any one of claims 1-8, wherein one or both of the flanking ITRs are modified by a deletion, an insertion, and/or a substitution in at least one of the ITR regions selected from the group consisting of: A, A', B, B', C, C', D, and D' regions.

10. The ceDNA vector of claim 9, wherein the deletion, insertion, and/or substitution results in the deletion of all or part of a stem-loop structure formed by the A, A', B, B', C, and/or C' regions.

11. The ceDNA vector of any one of claims 1-10, wherein:
one or both of the ITRs are modified by a deletion, an insertion, and/or a substitution that results in the deletion of all or part of a stem-loop structure normally formed by the B and B' regions;
one or both of the flanking ITRs are modified by a deletion, an insertion, and/or a substitution that results in the deletion of all or part of a stem-loop structure formed by the C and C' regions;
one or both of the flanking ITRs are modified by a deletion, an insertion, and/or a substitution that results in the deletion of all or part of a stem-loop structure formed by the B and B' regions and/or all or part of a stem-loop structure formed by the C and C' regions;
one or both of the flanking ITRs comprise a single stem-loop structure in the region that, in a wild-type ITR, would comprise a first stem-loop structure formed by the B and B' regions and a second stem-loop structure formed by the C and C' regions;
one or both of the flanking ITRs comprise a single stem and two loops in the region that, in a wild-type ITR, would comprise a first stem-loop structure formed by the B and B' regions and a second stem-loop structure formed by the C and C' regions;

one or both of the flanking ITRs comprise a single stem and a single loop in the region that, in a wild-type ITR, would comprise a first stem-loop structure formed by the B and B' regions and a second stem-loop structure formed by the C and C' regions; and/or
both of the flanking ITRs are altered in a manner that results in an overall three-dimensional symmetry when the flanking ITRs are inverted relative to each other.

12. The ceDNA vector of any one of claims 1-11, wherein the ceDNA vector is encapsulated in a lipid nanoparticle (LNP).

13. The ceDNA vector of any one of claims 1-12, for use in a vaccine.

14. A method of expressing an antigen, or an immunogenic peptide, in a cell comprising contacting the cell with the ceDNA vector of any one of claims 1-12, wherein the cell is *in vitro*.

15. The method of claim 14, wherein the at least one nucleic acid sequence is codon optimized for expression in the cell.

16. Use of the ceDNA vector of any one of claims 1-12 in the manufacture of a medicament for expressing an antigen, or an immunogenic peptide in a cell, wherein the medicament is to be contacted with the cell.

17. The use of claim 16, wherein the at least one nucleic acid sequence is codon optimized for expression in the cell.

18. Use of the ceDNA vector of any one of claims 1-12 in the manufacture of a medicament for preventing or treating a bacterial, a viral, a parasitic or a fungal infection in a subject, wherein the medicament is to be administered to the subject.

19. Use of the ceDNA vector of any one of claims 1-12 in the manufacture of a medicament for preventing or treating a cancer in a subject, wherein the medicament is to be administered to the subject.

20. Use of the ceDNA vector of any one of claims 1-12 in the manufacture of a medicament for preventing or treating an autoimmune disease or disorder in a subject, wherein the medicament is to be administered to the subject.

21. The use of any one of claims 18-20, wherein one or more additional therapeutic agents is to be further administered to the subject.

22. The use of any one of claims 18-20, wherein the ceDNA vector is to be administered by a route selected from the group consisting of: intravenous injection, subcutaneous injection, intratumoral injection and intramuscular injection.

23. A pharmaceutical composition comprising the ceDNA vector of any one of claims 1-12.

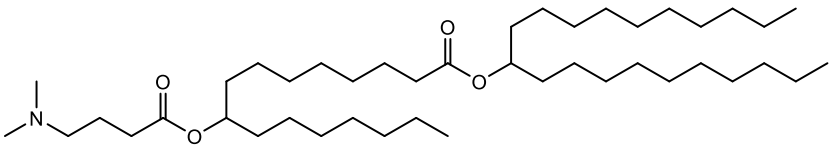
24. The pharmaceutical composition of claim 23, further comprising one or more additional therapeutic agents.

25. A vaccine composition comprising the ceDNA vector of any one of claims 1-12.

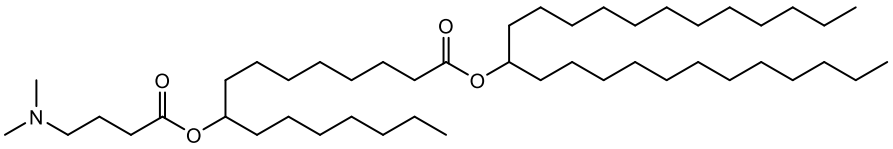
26. A composition comprising the ceDNA vector of any one of claims 1-12 and a lipid, wherein the lipid is a lipid nanoparticle (LNP).

27. The composition of claim 26, wherein the lipid nanoparticle comprises an ionizable lipid.

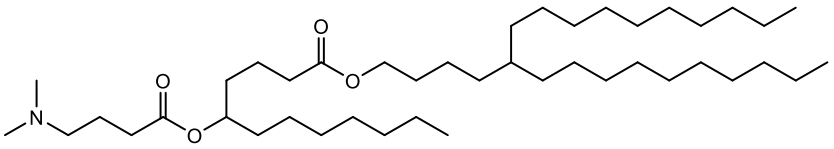
28. The composition of claim 27, wherein the ionizable lipid is selected from the group consisting of the following:



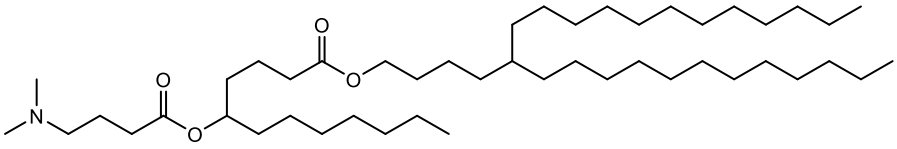
henicosan-11-yl 9-((4-(dimethylamino)butanoyl)oxy)hexadecanoate ;



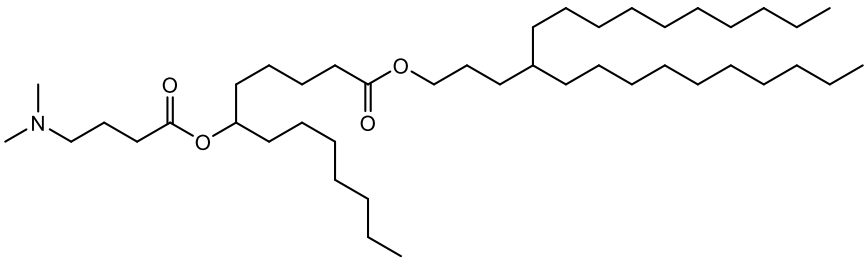
pentacosan-13-yl 9-((4-(dimethylamino)butanoyl)oxy)hexadecanoate ;



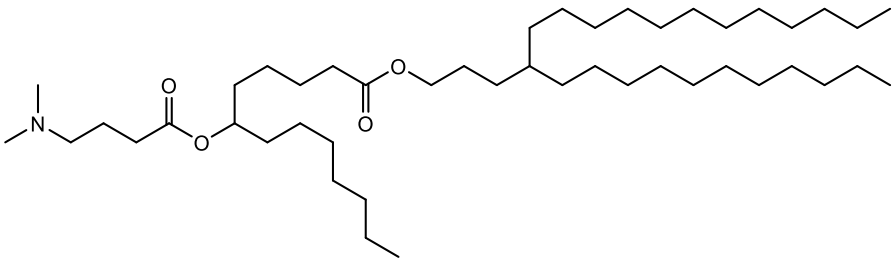
5-decylpentadecyl 5-((4-(dimethylamino)butanoyl)oxy)dodecanoate ;



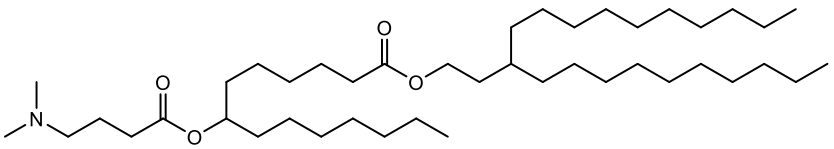
5-dodecylheptadecyl 5-((4-(dimethylamino)butanoyl)oxy)dodecanoate ;



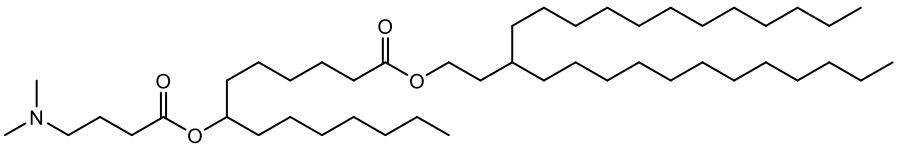
4-decyltetradecyl 6-((4-(dimethylamino)butanoyl)oxy)tridecanoate ;



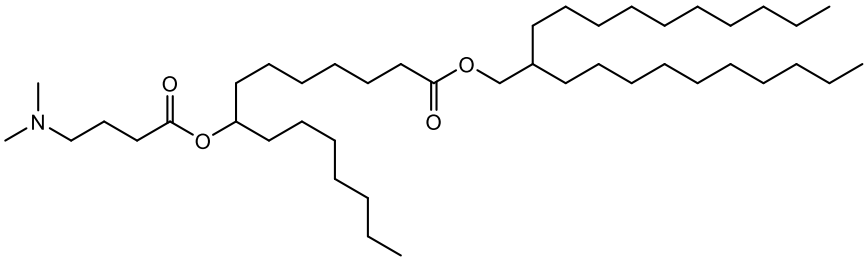
4-dodecylhexadecyl 6-((4-(dimethylamino)butanoyl)oxy)tridecanoate ;



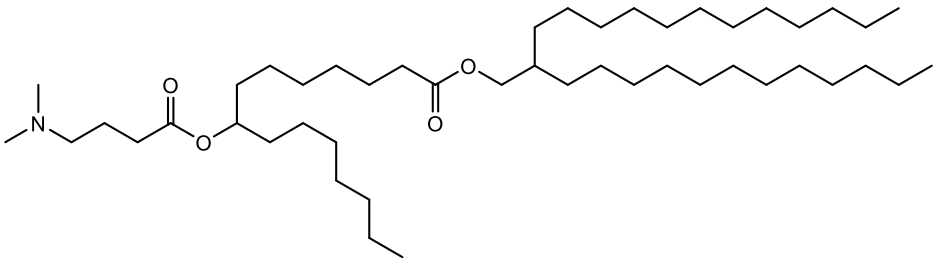
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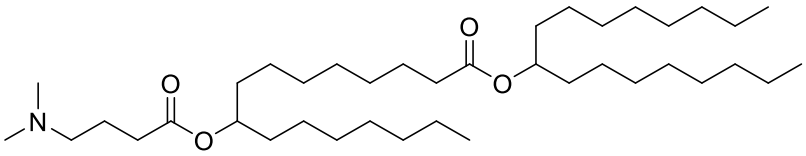
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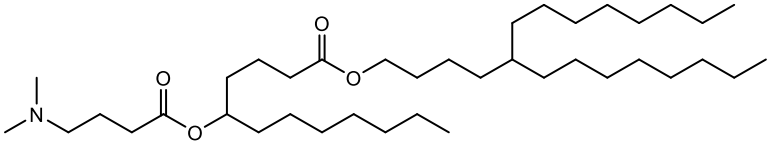
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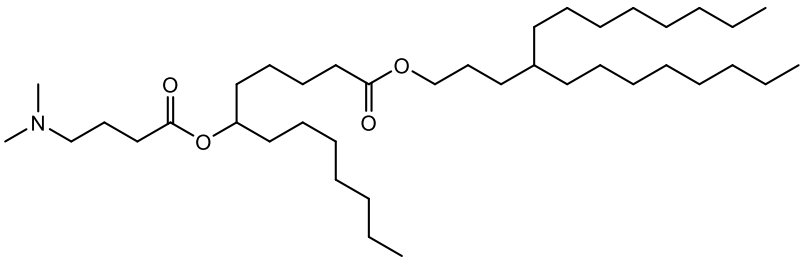
2-dodecyltetradecyl 8-((4-(dimethylamino)butanoyl)oxy)pentadecanoate ;



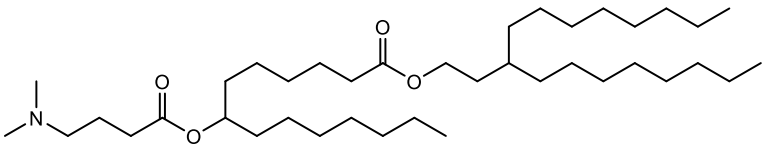
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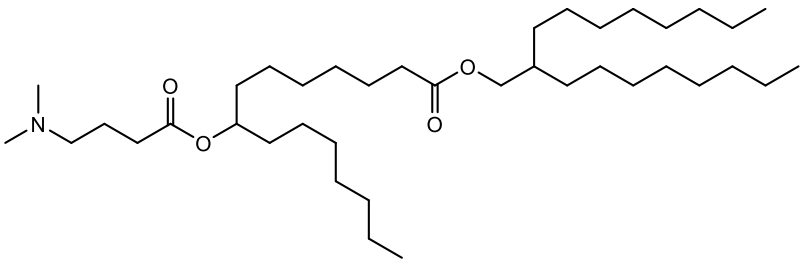
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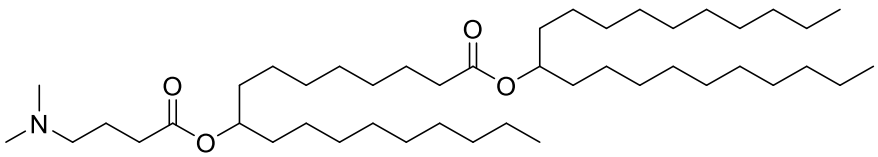
4-octyldodecyl 6-((4-(dimethylamino)butanoyl)oxy)tridecanoate ;



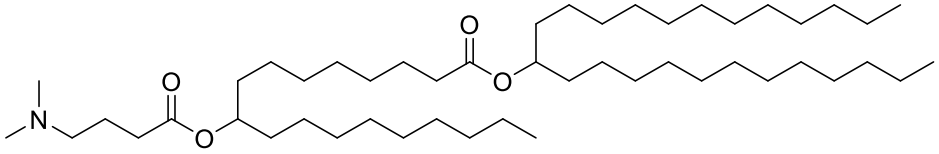
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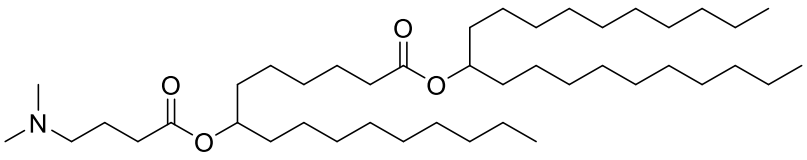
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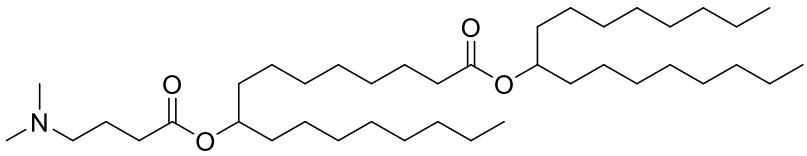
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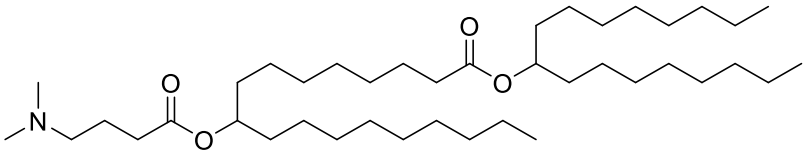
pentacosan-13-yl 9-((4-(dimethylamino)butanoyl)oxy)octadecanoate ;



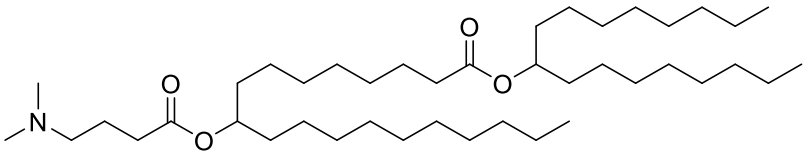
henicosan-11-yl 7-((4-(dimethylamino)butanoyl)oxy)hexadecanoate ;



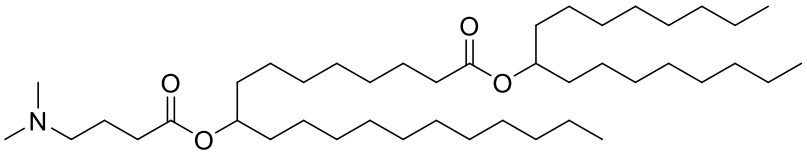
heptadecan-9-yl 9-((4-(dimethylamino)butanoyl)oxy)heptadecanoate ;



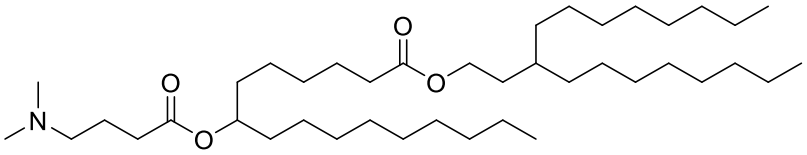
heptadecan-9-yl 9-((4-(dimethylamino)butanoyl)oxy)octadecanoate ;



heptadecan-9-yl 9-((4-(dimethylamino)butanoyl)oxy)nonadecanoate ;



heptadecan-9-yl 9-((4-(dimethylamino)butanoyl)oxy)icosanoate ; and



3-octylundecyl 7-((4-(dimethylamino)butanoyl)oxy)hexadecanoate ;

29. The composition of any one of claims 25-28, wherein the composition is lyophilized.

30. A kit comprising the ceDNA vector of any one of claims 1-12, the pharmaceutical composition of claim 23 or claim 24 or the composition of any one of claims 25-29.

31. The ceDNA vector of any one of claims 1-12 for use in therapy.