What is claimed is:

1. A compound of Formula (I):



(I),

or a pharmaceutically acceptable salt or solvate thereof; wherein:

R is -CH_3, -CH_2D, -CHD_2, or -CD_3;

~~R^1 is~~ R^2 is hydrogen, –C(O)NHR^5, –C(O)OR^5, –C(O)(linear or branched alkyl~~,~~), or –C(O)(linear or branched alkenyl~~, aryl or heteroaryl, wherein R^1 is optionally substituted with R^4;~~);

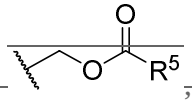
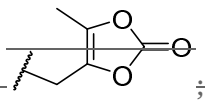
~~R^2 is hydrogen, –C(O)NHR^5, –C(O)R^1 or –C(O)OR^5;~~

R^3 is -C(O)OR^6~~, or -alkyl(OH);~~

~~or alternatively, R^2 and R^3 together is an alkylene group which with the atoms which they are each bonded to, forms a 5 to 6 membered ring wherein the 5 to 6 membered ring is optionally substituted with oxo~~;

R^4 is halogen, -OH, -OR^5, oxo, -NH_2, -NHR^5, -N(R^5)$_2$, -NO_2, -CF_3, –C_1-C_6 alkyl, or –C_1-C_6 haloalkyl;

R^5 is linear or branched alkyl;

~~R^6 is H, linear or branched alkyl, , or~~  ~~, or~~  ~~;~~

~~or alternatively,~~ R^6 and R^1 together is an alkylene group or an alkenylene group which with the atoms which they are each bonded to, forms a 12 to 25 membered ring, wherein 1, 2, 3, or 4 –CH_2– units making up the alkylene group or the alkenylene group is optionally replaced with a heteroatom selected from –O–, –S–, or –N–, provided that no adjacent –CH_2– is replaced; wherein the alkylene group or the alkenylene group is optionally substituted with one or more R^4; and

wherein, two R^4 on the same or adjacent carbon can form a 3 to 6 membered fused or spiro cycloalkyl ring or a 3 to 6 membered fused or spiro heterocyclic ring.

2. The compound of claim 1, wherein ~~R is –CH_3 or –CD_3.~~:

a) R is -CH_3 or -CD_3; or

b) R^2 is hydrogen.

3. The compound of claim 1 ~~or 2, wherein R^1 is C_6-C_{20} alkyl or C_6-C_{20} alkenyl.~~

~~4. The compound of any one of claims 1-3, wherein R^1 is C_6-C_{18} alkyl or C_6-C_{18} alkenyl.~~

~~5. The compound of claim 1 or 2, wherein R^1 is pyridyl.~~

~~6. The compound of any one of claims 1-5, wherein R^2 is hydrogen.~~

~~7. The compound of any one of claims 1-8, wherein R^2 is $C(O)OR^5$.~~

~~8. The compound of claim 7, wherein R^5 is linear or branched C_1-C_6 alkyl.~~

~~9. The compound of any one of claims 1-8, wherein R^3 is $C(O)OR^6$.~~

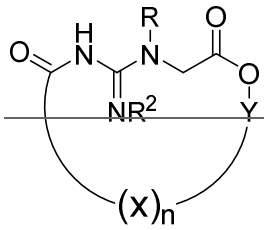
~~10. The compound of claim 9, wherein R^6 is H or linear or branched C_1-C_8 alkyl.~~

~~11. The compound of claim 1 or 2~~, wherein R^6 and R^1 together is an alkylene group or an alkenylene group which with the atoms which they are each bonded to, forms a ~~12~~13 to ~~25~~24 membered ring, wherein 1, 2, 3, or 4 –CH_2– units making up the alkylene group or the alkenylene group is optionally replaced with a heteroatom selected from –O–, –S–, or –N–, provided that no adjacent –CH_2– is replaced; wherein the alkylene group or the alkenylene group is optionally substituted with one or more R^4.

~~12. The compound of claim 11, wherein R^6 and R^1 together is an unsubstituted alkylene group or an unsubstituted alkenylene group which forms a 13 to 24 membered ring with the atoms which they are each bonded to.~~

~~13. The compound of any one of claims 1-12~~4. The compound of claim 1, wherein the compound is a pharmaceutically acceptable salt selected from sodium salt, potassium salt, lithium salt, Na_2PO_4H salt, hydrochloric acid salt, formic acid salt, trifluoroacetic acid salt, acetic acid salt or trichloroacetic acid/2 lithium salt.

~~14. The compound of claim 1, wherein the compound has the structure of Formula (II):~~



~~(II),~~

~~or a pharmaceutically acceptable salt or solvate thereof; wherein:~~

~~R is CH_3, CH_2D, CHD_2, CD_3;~~

~~R^2 is hydrogen, $C(O)NHR^5$, $C(O)R^1$ or $C(O)OR^5$;~~

~~R^1 is linear or branched alkyl, or linear or branched alkenyl, wherein R^1 is optionally substituted with R^4;~~

~~R^4 is halogen, OH, OR^5, oxo, NH_2, NHR^5, $N(R^5)_2$, NO_2, CF_3, C_1-C_6 alkyl, or C_1-C_6 haloalkyl;~~

~~X at each occurrence is independently $C(R^{5a})_2$, $C(R^{5a})_2C(R^{5a})_2$, $CH(R^{5a})CH(R^{5a})$, $C(R^{5a})=C(R^{5a})$, $OC(R^{5a})_2$, $OCH(R^{5a})$, $C(R^{5a})_2O$, or $CH(R^{5a})O$;~~

~~Y is $C(R^{5a})_2$, $CH(R^{5a})$, $C(R^{5a})_2C(R^{5a})_2$, $CH(R^{5a})CH(R^{5a})$, $C(R^{5a})=C(R^{5a})$, $C(R^{5a})_2O$, or $CH(R^{5a})O$;~~

~~n is 2, 3, 4, 5, 6, 7, or 8, wherein when n is 2, Y is $C(R^{5a})_2C(R^{5a})_2$, $CH(R^{5a})CH(R^{5a})$, $C(R^{5a})=C(R^{5a})$, $C(R^{5a})_2O$, or $CH(R^{5a})O$;~~

~~R^5 is H or linear or branched alkyl;~~

~~R^{5a} is H, halogen, -OH, $-OR^5$, $-NH_2$, $-NHR^5$, $-N(R^5)_2$, $-NO_2$, $-CF_3$, C_1-C_6 alkyl, or C_1-C_6 haloalkyl; and~~

~~wherein, two R^{5a} on the same or adjacent carbon can form a 3 to 6 membered fused or spiro cycloalkyl ring or a 3 to 6 membered fused or spiro heterocyclic ring.~~

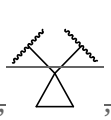
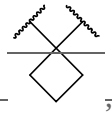
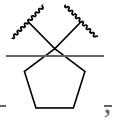
~~15. The compound of claim 14, wherein at least one of X is $-C(R^{5a})_2-C(R^{5a})_2-$, $-CH(R^{5a})-CH(R^{5a})-$, or $-C(R^{5a})=C(R^{5a})-$, wherein R^{5a} is H or $-C_1-C_6$ alkyl; and~~

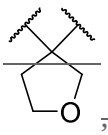
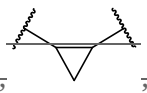
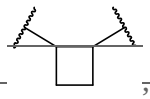
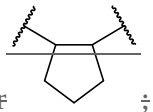
~~wherein, two R^{5a} on the same or adjacent carbon can form a 3 to 6 membered fused or spiro cycloalkyl ring or a 3 to 6 membered fused or spiro heterocyclic ring.~~

~~16. The compound of claim 14, wherein X is $-CH_2CH_2-$, $-CH=CH-$, $-O-CH_2-$, or $-CH_2-O-$.~~

~~17. The compound of any one of claims 14-16, wherein Y is $-C(R^{5a})_2-$, $-CH(R^{5a})-$; $-C(R^{5a})_2-C(R^{5a})_2-$, $-CH(R^{5a})-CH(R^{5a})-$, or $-C(R^{5a})=C(R^{5a})-$, wherein R^{5a} is H or $-C_1-C_6$ alkyl; and~~

~~wherein, two R^{5a} on the same or adjacent carbon can form a 3 to 6 membered fused or spiro cycloalkyl ring or a 3 to 6 membered fused or spiro heterocyclic ring.~~

~~18. The compound of any one of claims 14-16, wherein Y is $-C(R^{5a})_2-$, $-CH(R^{5a})-$; $-C(R^{5a})_2-C(R^{5a})_2-$, $-CH(R^{5a})-CH(R^{5a})-$, $-CH_2-$, $-CH_2CH_2-$, $-CH=CH-$,~~  ~~,~~  ~~,~~  ~~,~~

 ~~,~~  ~~,~~  ~~, or~~  ~~;~~

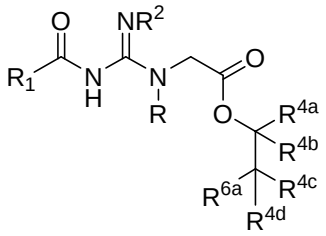
~~wherein, R^{5a} is linear or branched $-C_1-C_6$ alkyl.~~

~~19. The compound of any one of claims 14-18, wherein R is $-CH_3$ or $-CD_3$.~~

~~20. The compound of any one of claims 14-19, wherein R^2 is hydrogen.~~

~~21. The compound of any one of claims 14-20, wherein the compound is a pharmaceutically acceptable salt selected from sodium salt, potassium salt, lithium salt, Na_2PO_4H salt, hydrochloric acid salt, formic acid salt, trifluoroacetic acid salt, acetic acid salt or trichloroacetic acid/2 lithium salt.~~

~~22.~~5. The compound of claim 1, wherein the compound has the structure of Formula (I-A):



(I-A),

or a pharmaceutically acceptable salt or solvate thereof; wherein:

R is $-CH_3$, $-CH_2D$, $-CHD_2$, or $-CD_3$;

R^2 is hydrogen, $–C(O)NHR^5$, $–C(O)$~~R^1~~OR^5, $–C(O)$(linear or ~~$–C(O)OR^5$~~;

~~R^3 is $–C(O)OR^6$, or~~ branched alkyl~~(OH);~~

~~),~~ or $–C(O)$(linear or ~~alternatively, R^2 and R^3 together is an alkylene group which with the atoms which they are each bonded to, forms a 5 to 6 membered ring wherein the 5 to 6 membered ring is optionally substituted with oxo;~~branched alkenyl);

R^4 is halogen, -OH, $-OR^5$, oxo, $-NH_2$, $-NHR^5$, $-N(R^5)_2$, $-NO_2$, $-CF_3$, $–C_1$-C_6 alkyl, or $–C_1$-C_6 haloalkyl;

R^{4a}, R^{4b}, R^{4c}, and R^{4d}, each independently, is H, halogen, -OH, $-OR^5$, oxo, $-NH_2$, $-NHR^5$, $-N(R^5)_2$, $-NO_2$, $-CF_3$, $–C_1$-C_6 alkyl, or $–C_1$-C_6 haloalkyl;

R^5 is linear or branched alkyl;

R^{6a} and R^1 together is an alkylene group or an alkenylene group which with the atoms which they are each bonded to, forms a 12 to 25 membered ring, wherein 1, 2, 3, or 4 $–CH_2–$ units making up the alkylene group or the alkenylene group is optionally replaced with a heteroatom selected from –O–, –S–, or –N–, provided that no adjacent $–CH_2–$ is replaced; wherein the alkylene group or the alkenylene group is optionally substituted with one or more R^4; and

wherein, R^{4a} and R^{4b} or R^{4c} and R^{4d} together can form a 3 to 6 membered spiro cycloalkyl ring or a 3 to 6 membered spiro heterocyclic ring; or

wherein R^{4b} and R^{4c} together can form a 3 to 6 membered fused cycloalkyl ring or a 3 to 6 membered fused heterocyclic ring.

~~23.~~6. The compound of claim ~~22~~5, wherein R^{4a} is $–C_1$-C_6 alkyl and R^{4b}, R^{4c}, and R^{4d} are each H.

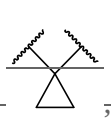
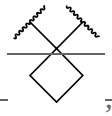
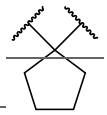
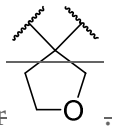
24.7. The compound of claim 23, wherein R^{4b} is C_1-C_6 alkyl.

25. The compound of claim 22 or 23, wherein R^{4c} is C_1-C_6 alkyl.

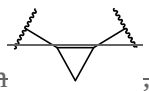
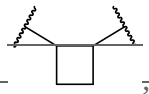
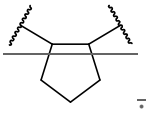
26. The compound of claim 22 or 23, wherein R^{4b}, R^{4c}, and R^{4d} is H.

27. The compound of claim 22 or 25, wherein R^{4b} and R^{4d} is H.

28. The compound of claim 22, wherein R^{4a} and R^{4b} together form a 3 to 6 membered spiro cycloalkyl ring or a 3 to 6 membered spiro heterocyclic ring.

29. The compound of claim 28, wherein R^{4a} and R^{4b} together form  ,  ,  , or  .

30. The compound of claim 22, wherein R^{4b} and R^{4c} together form a 3 to 6 membered fused cycloalkyl ring or a 3 to 6 membered fused heterocyclic ring.

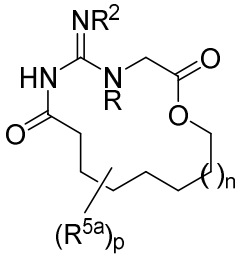
31. The compound of claim 30, wherein R^{4b} and R^{4c} together form  ,  , or  .

32. The compound of any one of claims 22-31, wherein R is CH_3 or CD_3.

33. The compound of any one of claims 22-32, wherein R^2 is hydrogen.

~~34. The compound of any one of claims 22-33, wherein the compound is a pharmaceutically acceptable salt selected from sodium salt, potassium salt, lithium salt, Na_2PO_4H salt, hydrochloric acid salt, formic acid salt, trifluoroacetic acid salt, acetic acid salt or trichloroacetic acid/2 lithium salt.~~

~~35. The compound of claim~~ 1, wherein the compound has the structure of Formula (III-A):



(III-A),

or a pharmaceutically acceptable salt or solvate thereof; wherein:

R is $-CH_3$, $-CH_2D$, $-CHD_2$, $-CD_3$;

~~R^1 is~~ R^2 is hydrogen, $–C(O)NHR^5$, $–C(O)OR^5$, $–C(O)$(linear or branched alkyl~~,~~), or $–C(O)$(linear or branched alkenyl~~;~~);

~~R^2 is hydrogen, $-C(O)NHR^5$, $-C(O)R^1$ or $-C(O)OR^5$;~~

R^5 is H or linear or branched alkyl;

R^{5a} is halogen, $-OH$, $-OR^5$, oxo, $-NH_2$, $-NHR^5$, $-N(R^5)_2$, $-NO_2$, $-CF_3$, $–C_1$-C_6 alkyl, or $–C_1$-C_6 haloalkyl;

wherein, two R^{5a} on the same or adjacent carbon can form a 3 to 6 membered fused or spiro cycloalkyl ring or a 3 to 6 membered fused or spiral heterocyclic ring;

n is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11; and

p is 0, 1, 2, 3, 4, 5, 6, 7, or 8.

~~36.~~ 8. The compound of claim ~~35~~7, wherein R is $-CH_3$ or $-CD_3$.

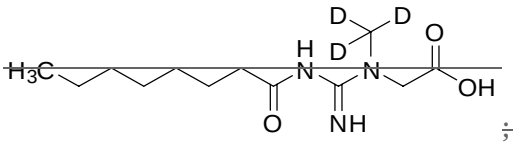
~~37.~~ 9. The compound of claim ~~35 or 36~~7, wherein R^2 is H.

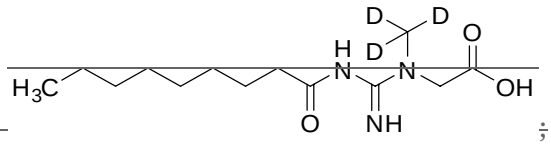
~~38.~~ 10. The compound of ~~any one of claims 35-37~~claim 7, wherein n is 0, 1, 2, 3, 4, 5, 6, or 7.

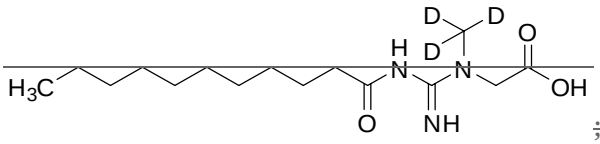
~~39.~~ 11. The compound of ~~any one of claims 35-38~~claim 7, wherein p is 0, 1, or 2.

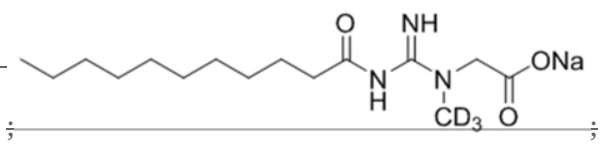
~~40.~~ 12. The compound of ~~any one of claims 35-39~~claim 7, wherein R^{5a} is $-C_1$-C_6 alkyl.

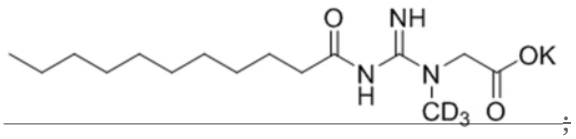
~~41. The compound of claim 1, selected from:~~

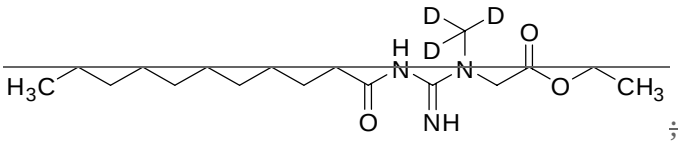

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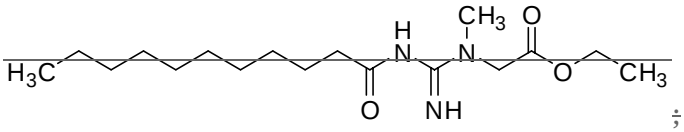

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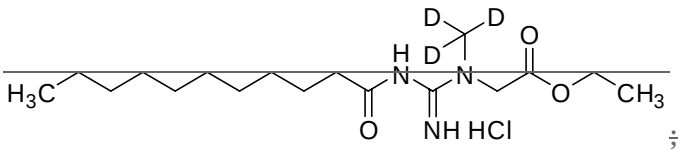

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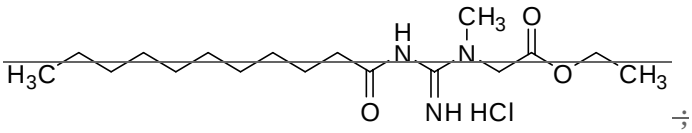

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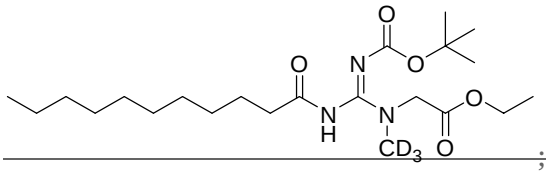

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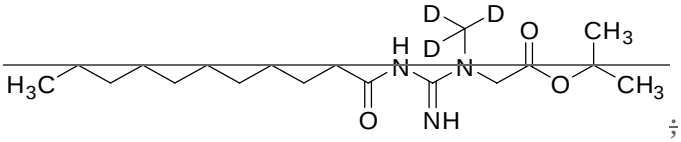

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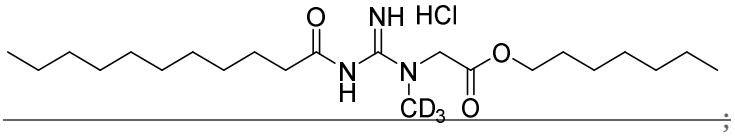

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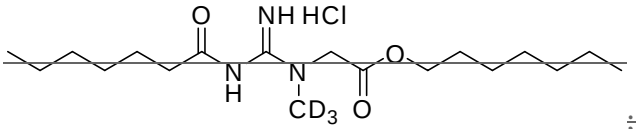

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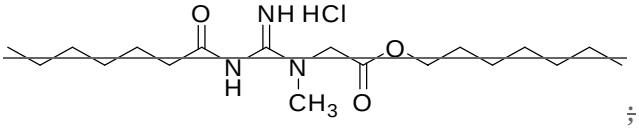

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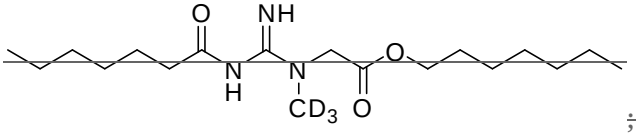


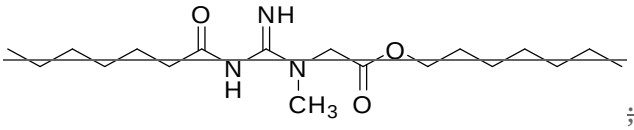


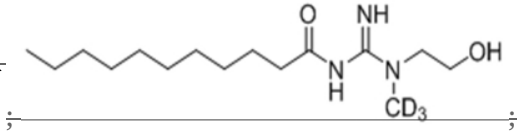


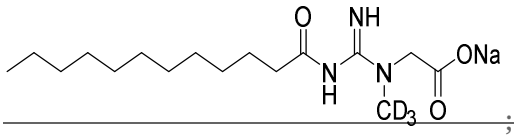


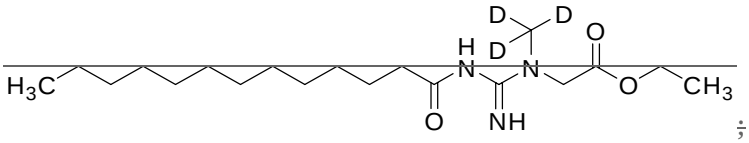


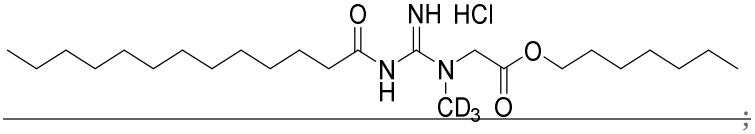


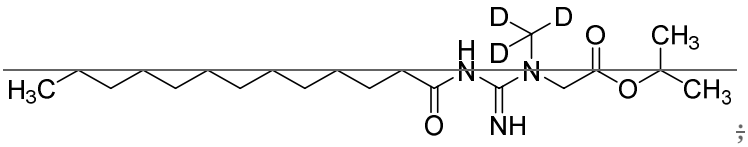


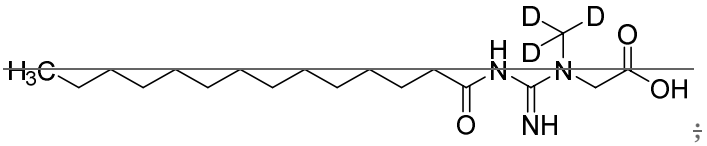


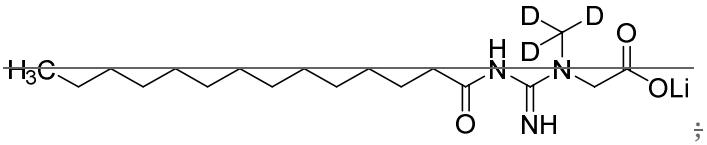


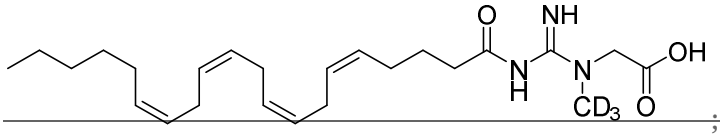


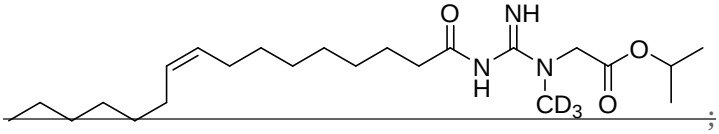


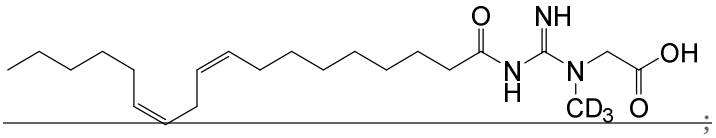

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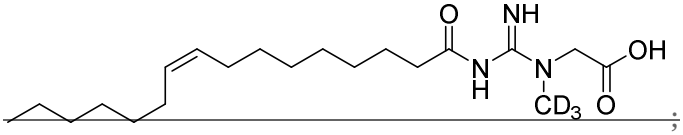

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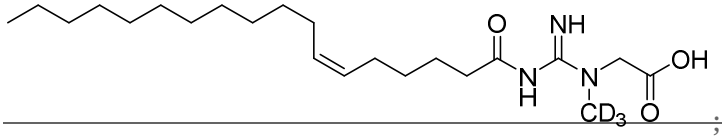

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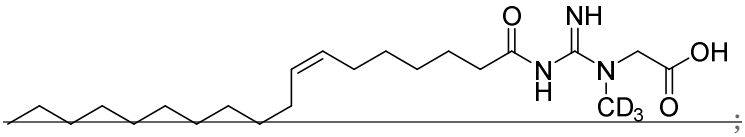

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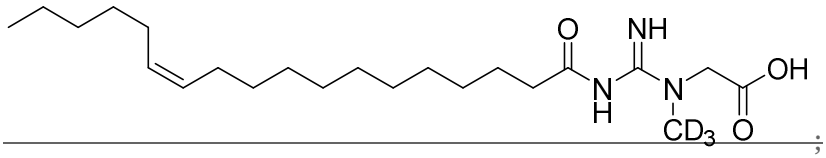

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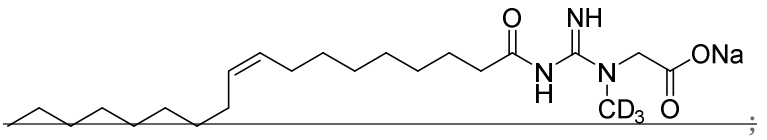

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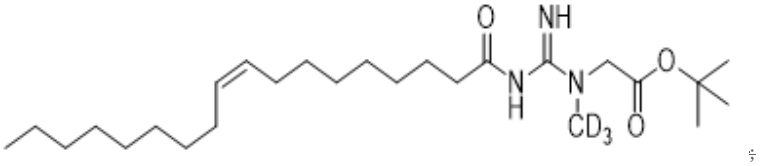

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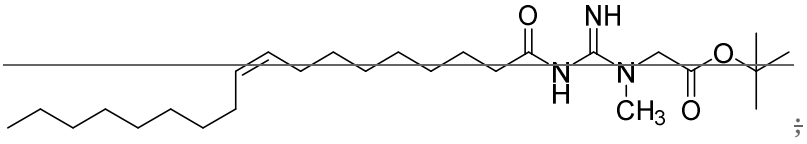

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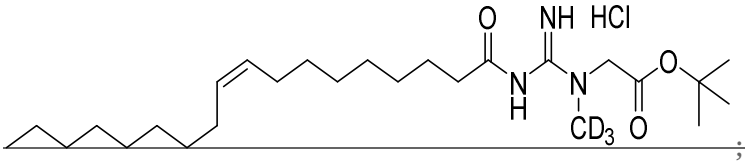

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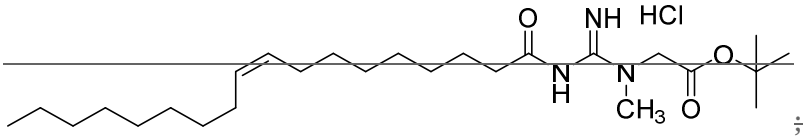

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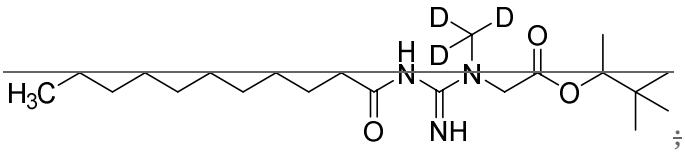


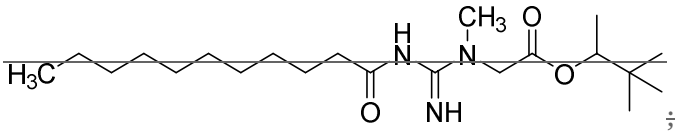


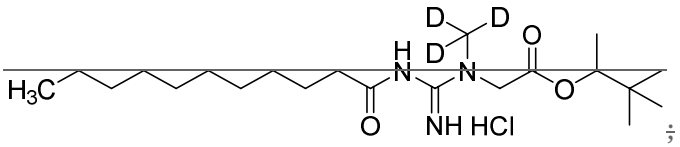


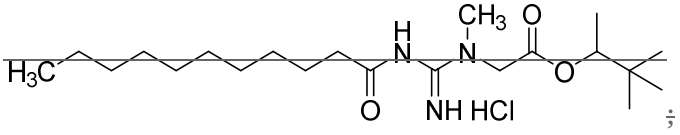


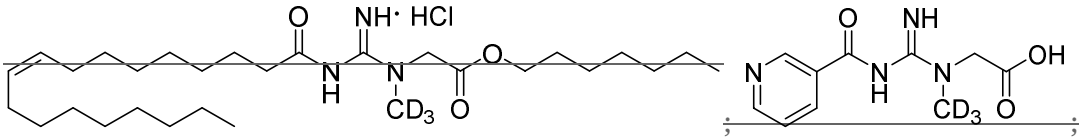


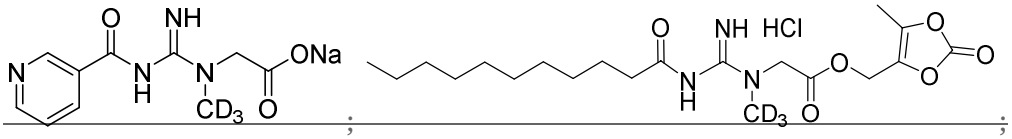


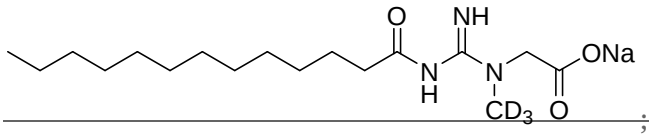


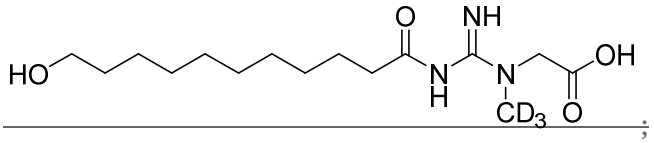


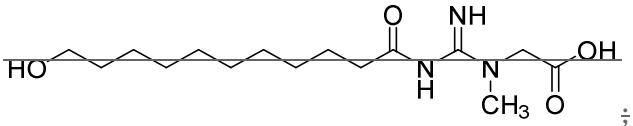


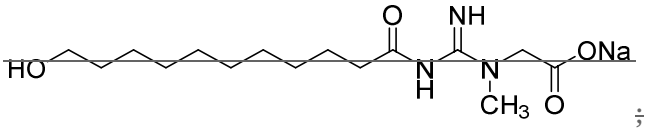


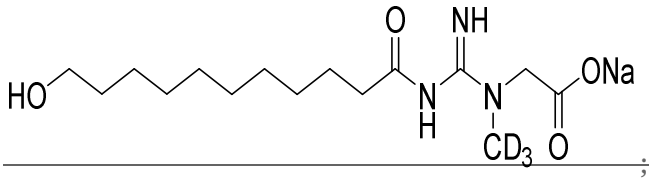

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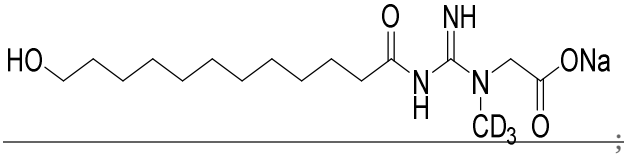

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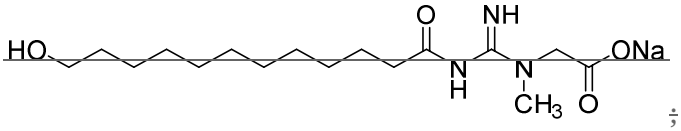

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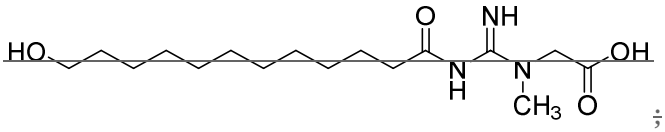

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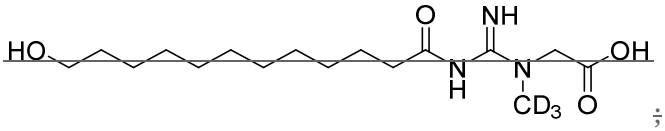

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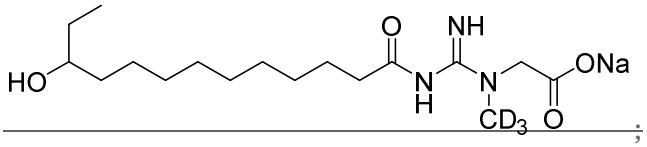

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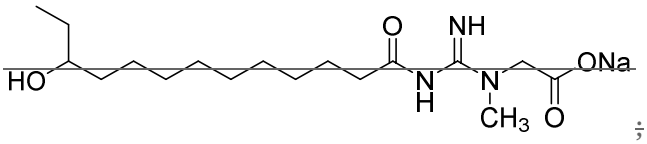

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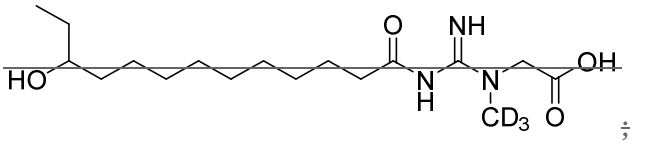

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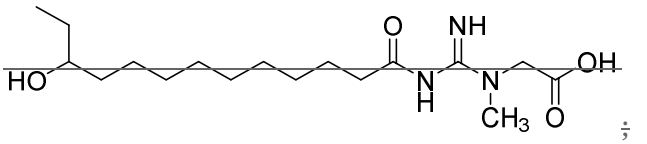

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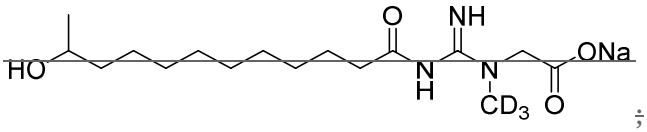

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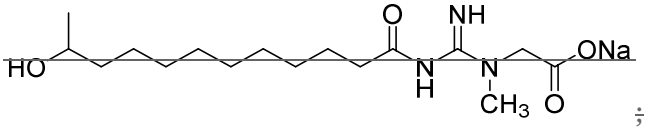

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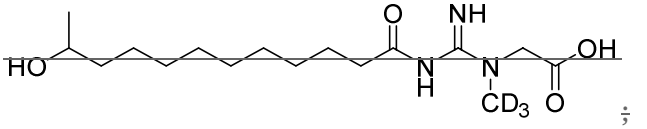

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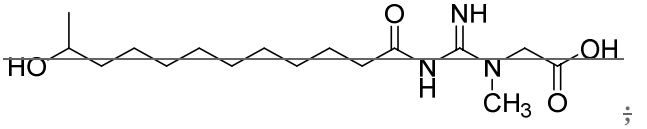

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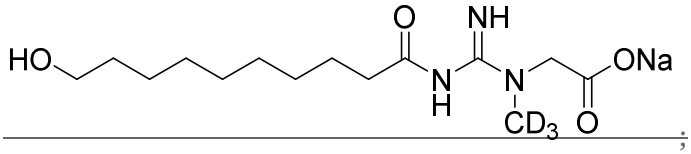

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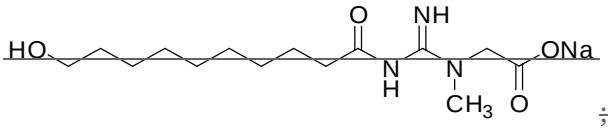

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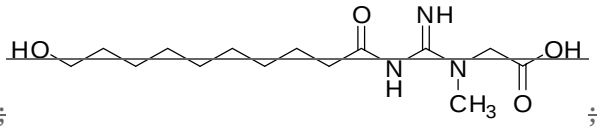

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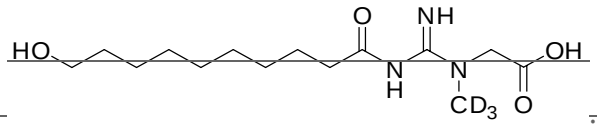

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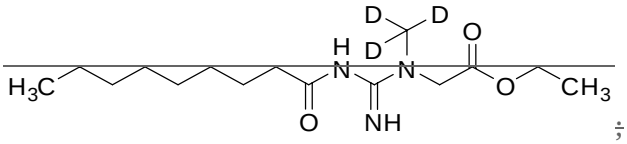


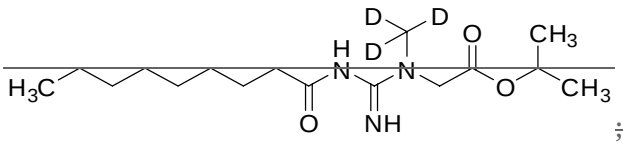


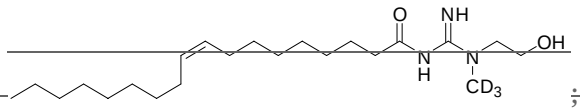


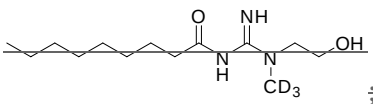
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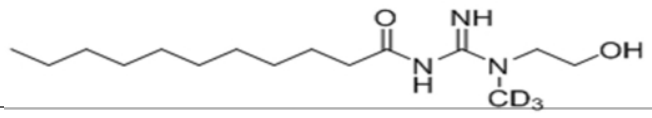
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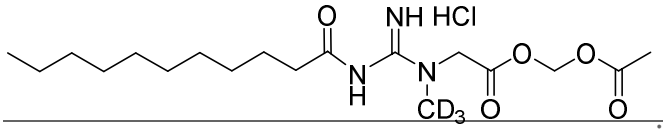




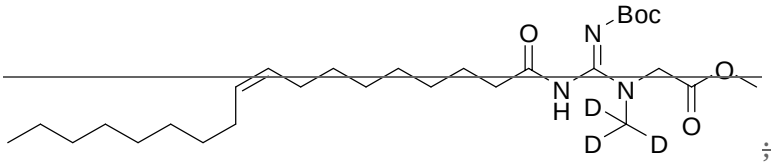


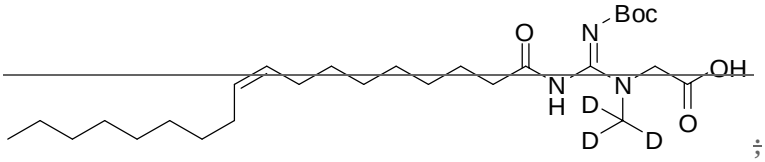


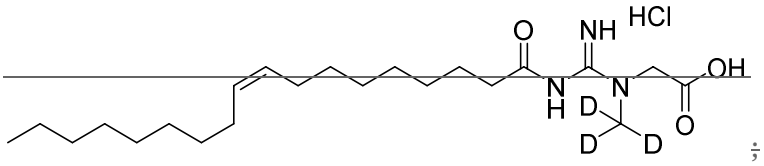
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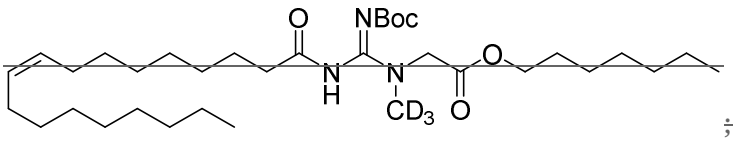


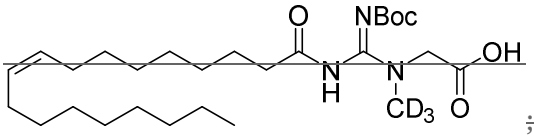
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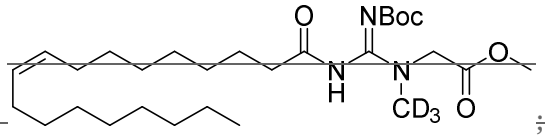


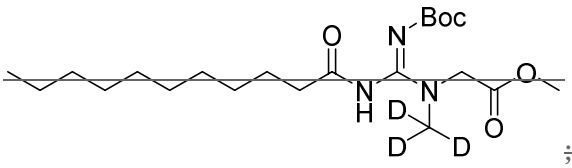


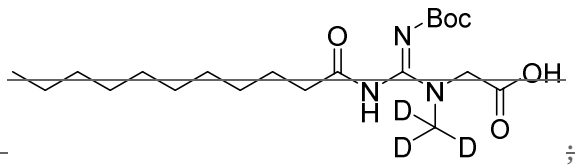

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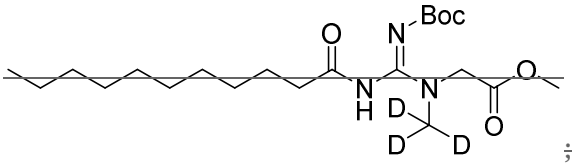

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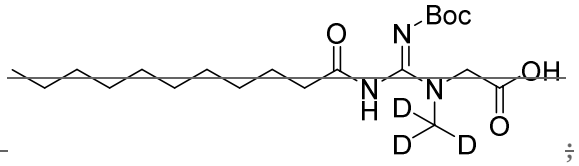

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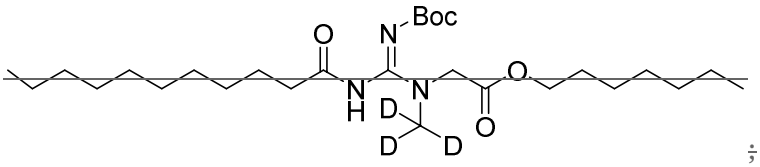

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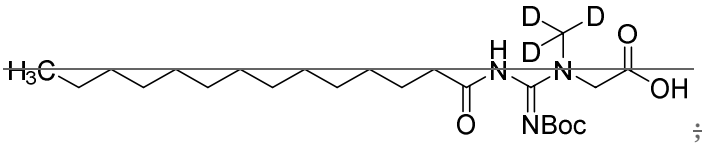

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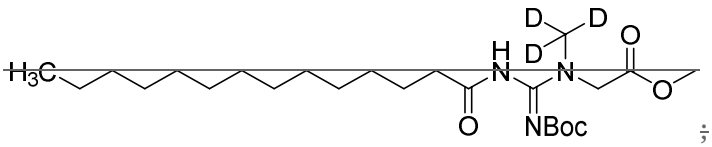

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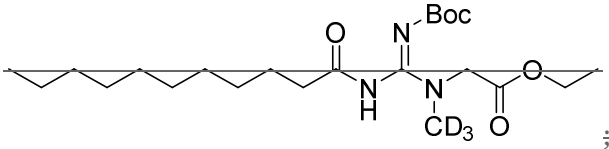

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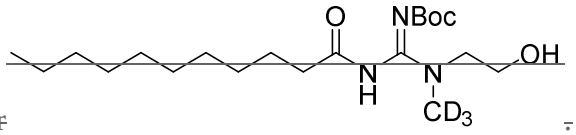

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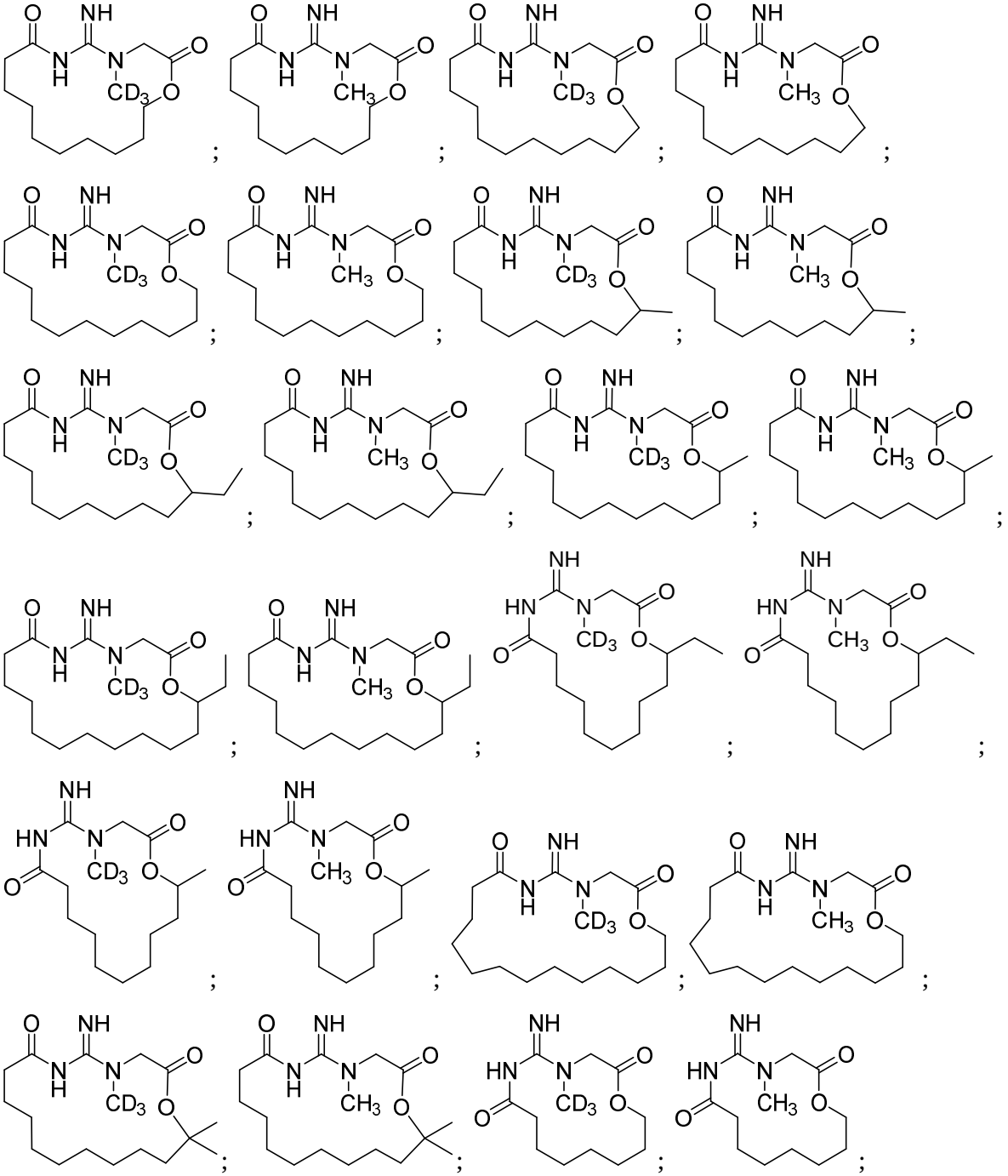

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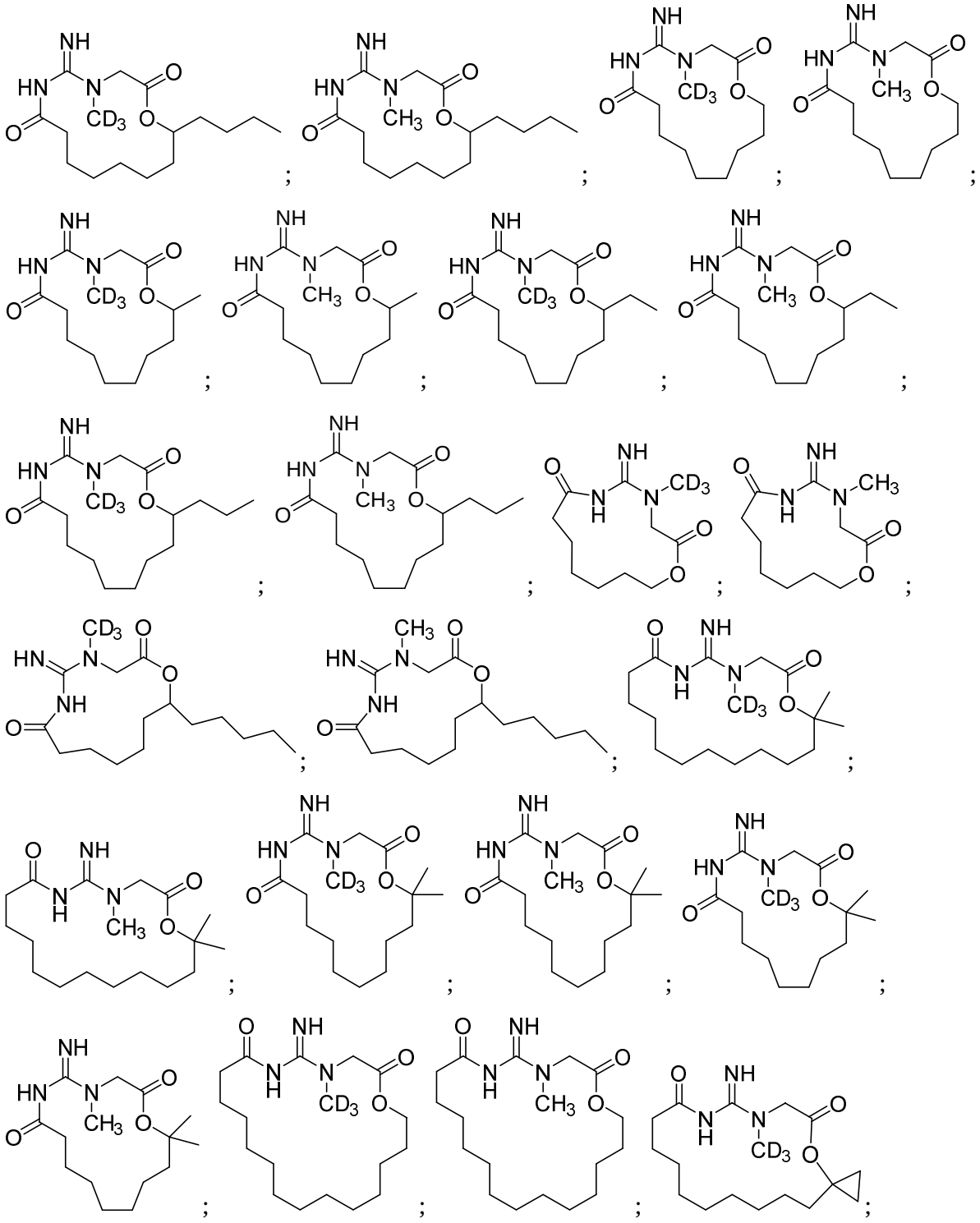

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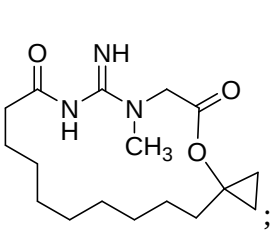
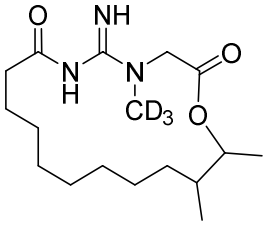
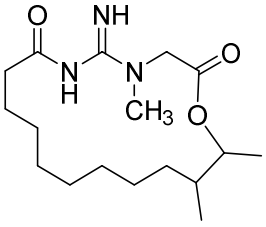
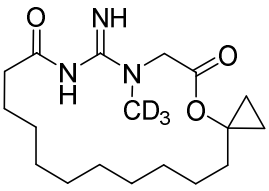
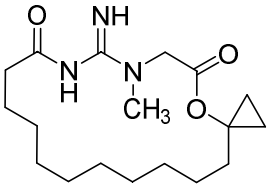
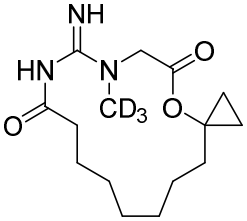
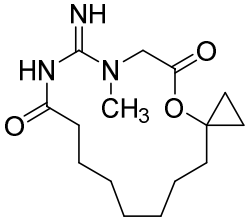
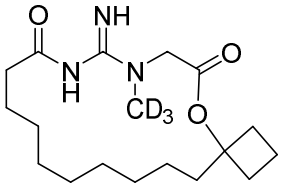
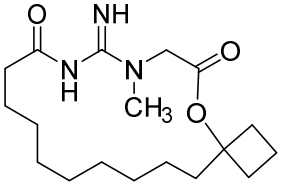
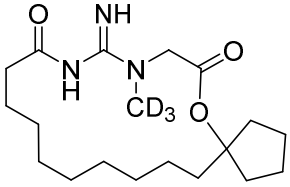
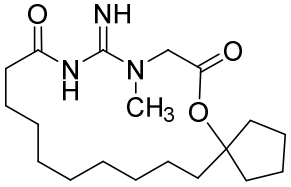
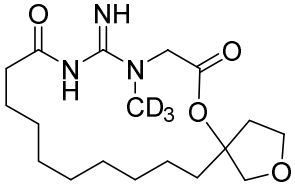
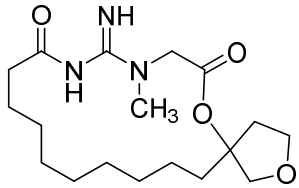
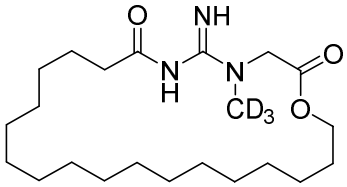
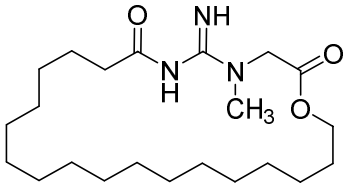

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~~44~~13. The compound of claim 1, selected from:

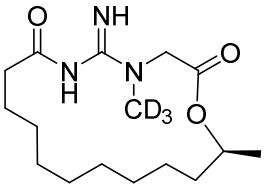
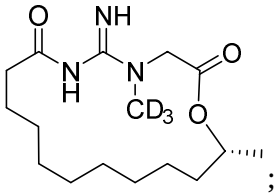
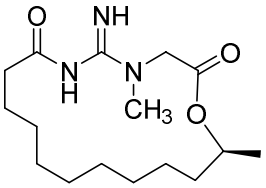
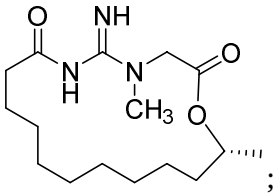
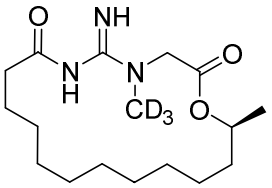
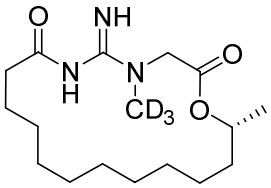
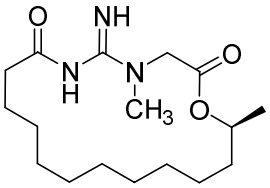
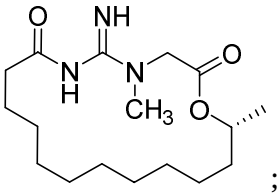


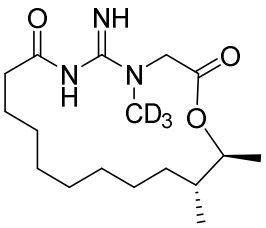
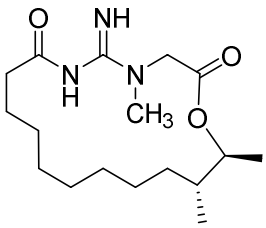
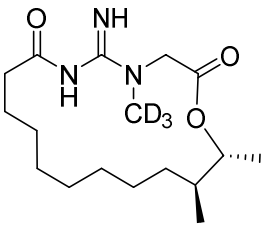
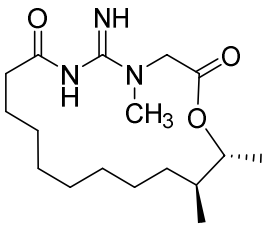


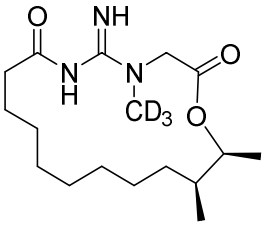
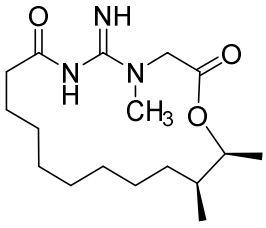
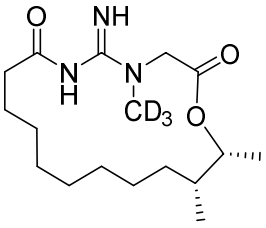
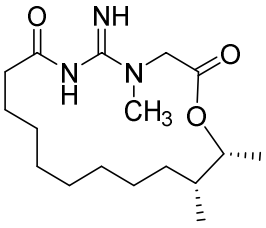

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or a pharmaceutically acceptable salt thereof.

~~45~~14. The compound of claim 1, selected from:

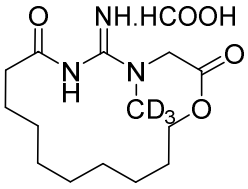
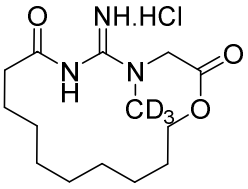
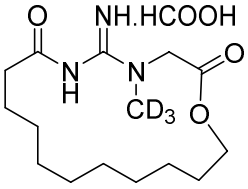
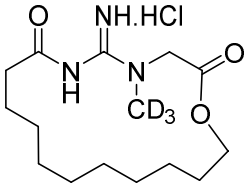

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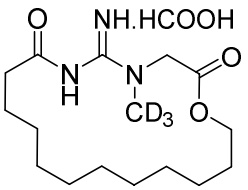
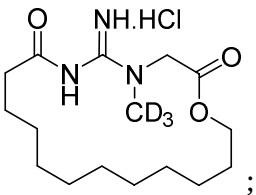
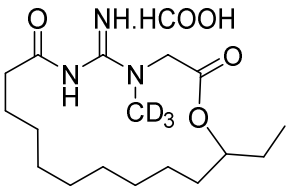
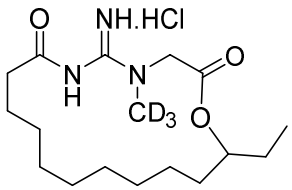
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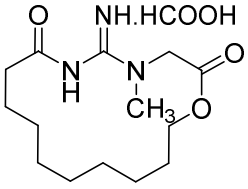
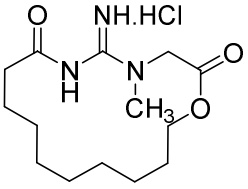
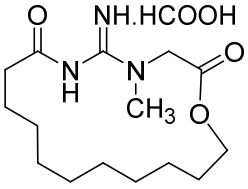
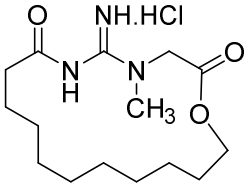
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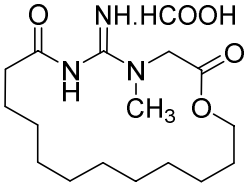
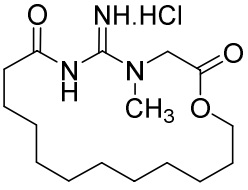
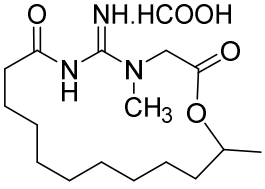
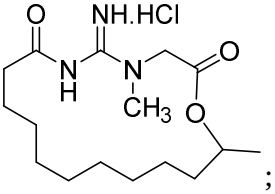
or a pharmaceutically acceptable salt thereof.

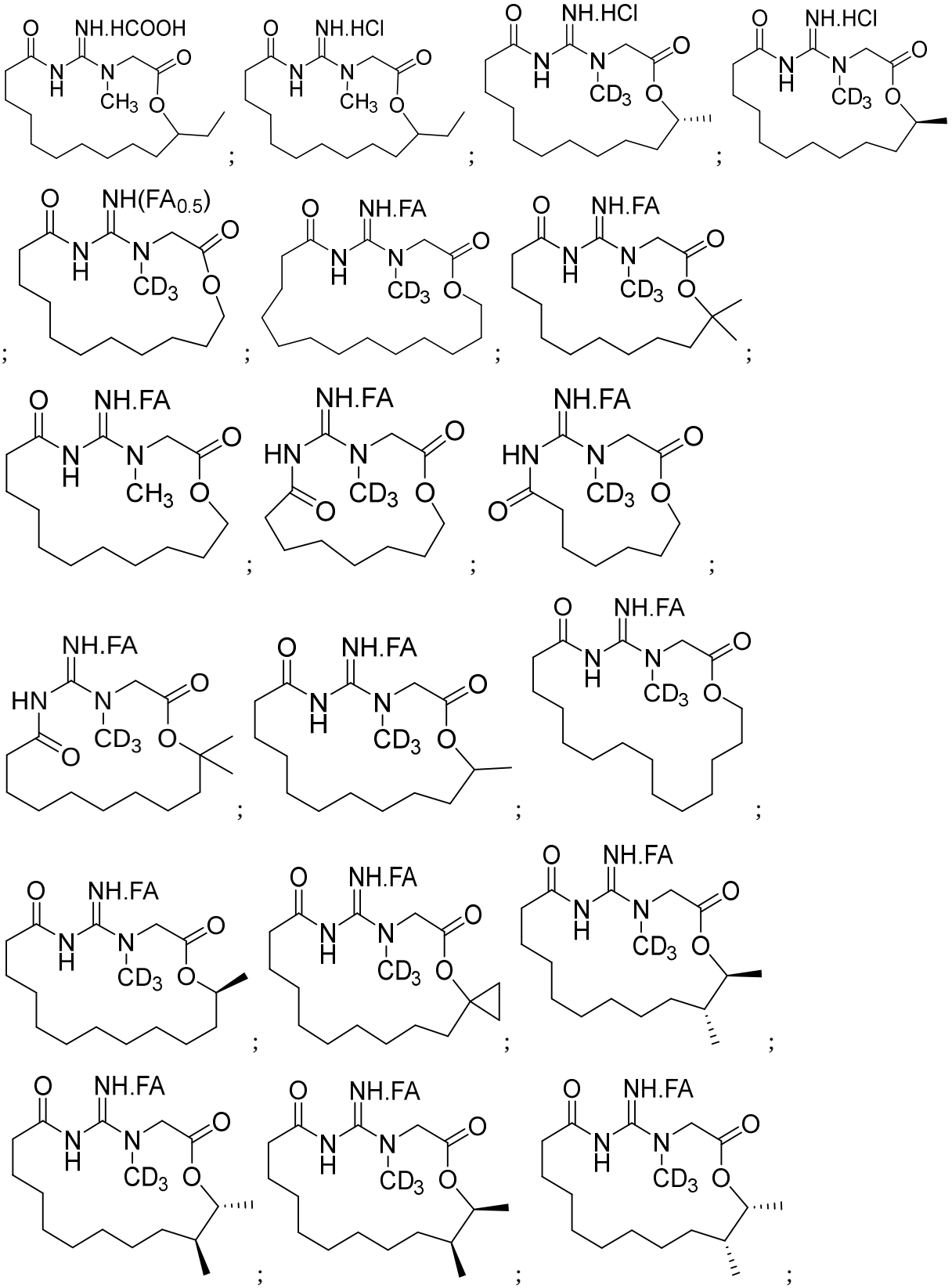
~~46~~15. The compound of claim 1, selected from:

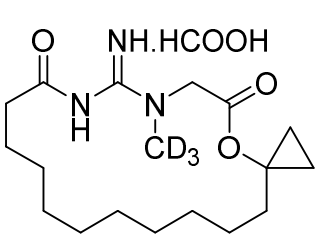
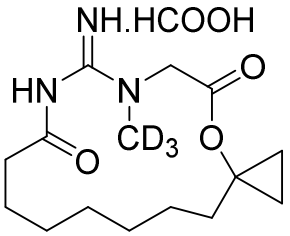
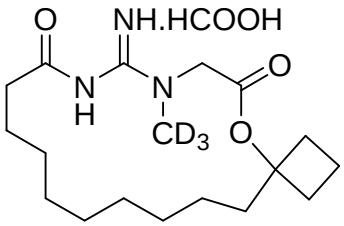
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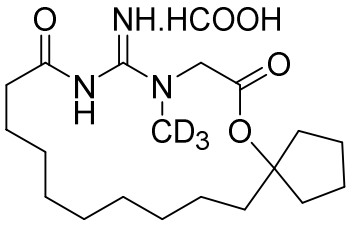
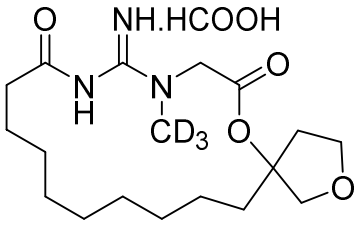
; ; ; ;

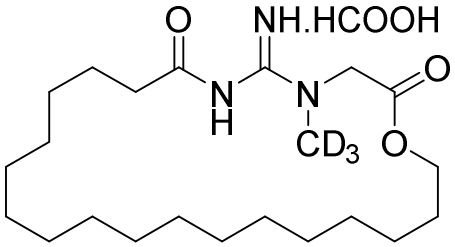
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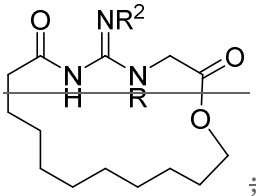
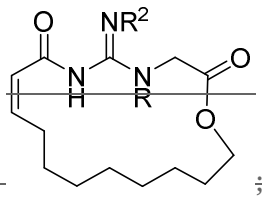
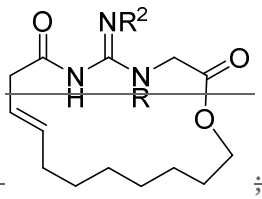
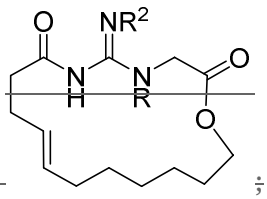


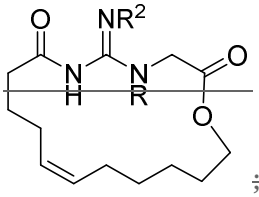
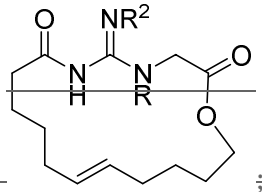
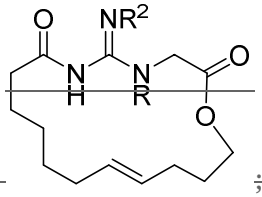
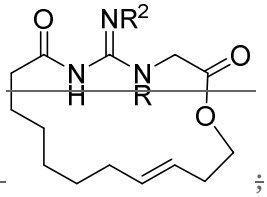

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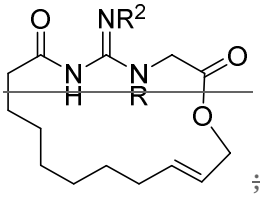
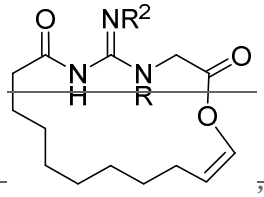

; 
; or


; wherein FA is formic acid (HCOOH).

~~47. The compound of claim 1, selected from:~~


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~~;~~ 
~~;~~

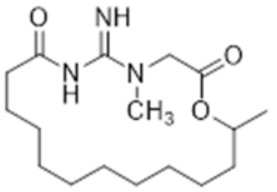

~~;~~ 
~~;~~ 
~~;~~ 
~~;~~


~~; or~~ 
~~, or a pharmaceutically acceptable salt thereof, wherein R is -CH_3 or -CD_3 and R^2 is H.~~

~~48. The compound of claim 1, selected from Table S1 or Table S2.~~

~~49.~~ 16. A pharmaceutical composition comprising a compound of ~~any one of claims 1 to 48~~claim 1, or a pharmaceutically acceptable salt or solvate thereof, and a pharmaceutically acceptable carrier.

~~50. A method of delivering creatine or deuterated creatine to a patient in need thereof comprising administering to the patient a therapeutically effective amount of~~ 17. A compound ~~of any one of claims 1 to 48,~~ having the structure:



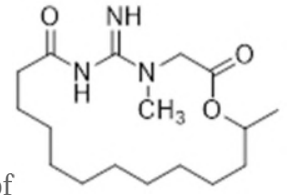
or a pharmaceutically acceptable salt ~~or solvate~~ thereof.

~~51. A method for treating creatine deficiency in a patient in need thereof comprising administering to the patient a therapeutically effective amount of a~~ 18. The compound of ~~any one of claims 1 to 48, or a pharmaceutically acceptable salt or solvate thereof.~~

~~52. The method of~~ claim ~~51~~17, wherein the ~~creatine deficiency comprises a disease or condition associated with creatine transporter dysfunction.~~

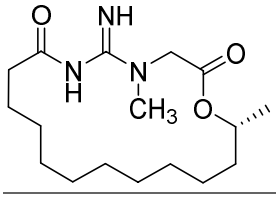
~~53. The method of claim 51, wherein the creatine deficiency comprises a disease or condition associated with creatine synthesis disorder.~~

~~54. A method of treating a disease in a patient in need thereof comprising administering a therapeutically effective amount of a~~ compound ~~of any one of claims 1 to 48, or a pharmaceutically acceptable salt or solvate thereof; wherein the disease is ischemia, oxidative stress, a neurodegenerative disease, ischemic reperfusion injury, a cardiovascular disease, a~~

~~genetic disease affecting the creatine kinase system, multiple sclerosis, a psychotic disorder or muscle fatigue.~~ is a hydrochloric acid salt of .

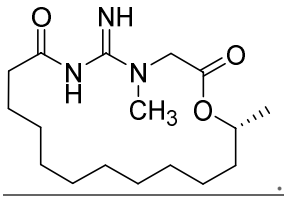
~~55. The method of claim 54, wherein the genetic disease affecting the creatine kinase system is a creatine transporter disorder or a creatine synthesis disorder.~~

~~56.~~ 19. A ~~method of enhancing muscle strength in a patient comprising administering to a patient in need of such enhancement a therapeutically effective amount of a~~ compound ~~of any one of claims 1 to 48,~~ having the structure:



or a pharmaceutically acceptable salt ~~or solvate~~ thereof.

20. The compound of claim 19, wherein the compound is a hydrochloric acid salt of

.