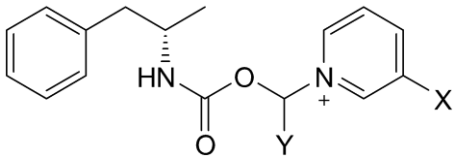
BRIEF SUMMARY

[0012] The presently described technology provides, in part, novel compounds, and compositions of the stimulant d-amphetamine ("d-Amp", "dextroamphetamine"), salts thereof, other derivatives thereof, and combinations thereof.

[0012a] In an aspect, there is provided a compound having the structure of Formula I:



or a pharmaceutically acceptable salt thereof,

where X is selected from the group consisting of esters, carboxylic acids, amino acids, amino acid residues, and amides,

wherein when X is an amide, at least one amide substituent is hydrogen, or at least one amide substituent comprises at least two carbons,

and Y is selected from the group consisting of hydrogen, alkenyl, alkoxy, alkyl, alkynyl, aryl, alkylaryl, cycloalkenyl, cycloalkyl, cycloalkynyl, heteroalkyl, heteroaryl, and heterocycle.

[0012b] In another aspect, there is provided a composition comprising the compound as defined above or pharmaceutically acceptable salt of the compound.

[0012c] In another aspect, there is provided a kit comprising individual doses of a therapeutically effective amount of a composition comprising the compound as defined above, a pharmaceutical salt thereof, or a combination thereof.

[0012d] In another aspect, there is provided a kit comprising individual doses of a therapeutically effective amount of a composition comprising at least one compound as defined above, a pharmaceutical salt thereof, or a combination thereof.

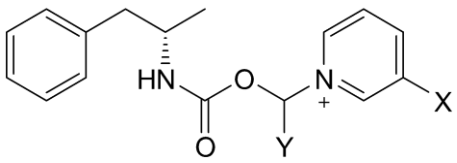
[0013] In some examples, the present technology provides compounds and/or compositions comprising d-amphetamine and one or more organic compounds. In some examples of the present technology, the organic compound comprises a heterocyclic nitrogen compound. Heterocyclic nitrogen compounds are commonly found in nature and are involved in several biological functions in plants and animals. Examples of heterocyclic nitrogen compounds for use in the practice of the present technology include, but are not limited to, for example, pyridine derivatives, some of which play an important role in the nicotinate and tryptophan

metabolism. In these compounds, one carbon of the phenyl ring is commonly replaced by a nitrogen atom.

[0014] In some examples of the present technology, the organic compound comprises an amino acid. Amino acids are organic compounds containing both a carboxyl (—COOH) and amino ($—NH_2$) group, and a variable side chain group. Amino acids that may be used in the present technology can be natural, standard, non-standard, unusual, synthetic, and/or essential amino acids, and can be an L-amino acid or a D-amino acid, or a combination thereof. Examples of amino acids for use in the practice of the present technology include, but are not limited to, alanine, arginine, asparagine, aspartic acid, cysteine, glutamine, glutamic acid, glycine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, proline, serine, threonine, tryptophan, tyrosine, valine, ornithine, homoarginine, citrulline, homocitrulline, homoserine, theanine, γ-aminobutyric acid, 6-aminohexanoic acid, sarcosine, carnitine, 2-aminoadipic acid, pantothenic acid, taurine, hypotaurine, lanthionine, thiocysteine, cystathionine, homocysteine, β-alanine, β -aminoisobutyric acid, β-leucine, β-lysine, β-arginine, β-tyrosine, β-phenylalanine, isoserine, β-glutamic acid, β-tyrosine, β-dopa (3,4-dihydroxy-L-phenylalanine), 2-aminoisobutyric acid, isovaline, di-N-ethylglycine, N-methyl-alanine, L-abrine, 4-hydroxyproline, 5-hydroxylysine, 3-hydroxyleucine, 4-hydroxyisoleucine, 5-hydroxy-L-tryptophan, 1-aminocyclopropyl-1-carboxylic acid, azetidine-2-carboxylic acid, pipecolic acid, allylglycine, cyclohexylglycine, N-(4-hydroxyphenyl)glycine, N-(chloroacetyl)glycline ester, 2-(trifluoromethyl)-phenylalanine, 4-(hydroxymethyl)-phenylalanine, 4-amino-

CLAIMS

1. A compound having the structure of Formula I:



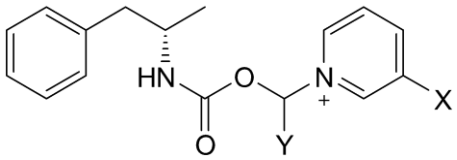
or a pharmaceutically acceptable salt thereof,

where X is selected from the group consisting of esters, carboxylic acids, amino acids, amino acid residues, and amides,

wherein when X is an amide, at least one amide substituent is hydrogen, or at least one amide substituent comprises at least two carbons,

and Y is selected from the group consisting of hydrogen, alkenyl, alkoxy, alkyl, alkynyl, aryl, alkylaryl, cycloalkenyl, cycloalkyl, cycloalkynyl, heteroalkyl, heteroaryl, and heterocycle.

2. The compound of claim 1 having the structure of Formula IB or the pharmaceutically acceptable salt of said compound:



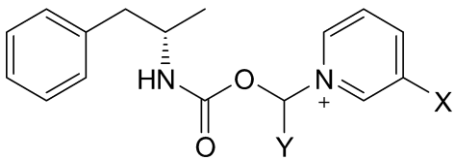
where X is A-COO-R;

where A is either absent or, when present, is selected from the group consisting of alkenyl, alkenylaminocarbonyl, alkoxy, alkoxycarbonyl, alkyl, alkylamino, alkylaminocarbonyl, alkylammonium, alkylcarbonyl, alkylcarbonylamino, alkylcarbonyloxy, alkylsulfinyl, alkylsulfonyl, alkylthio, alkynyl, alkynylaminocarbonyl, aryl, substituted aryl, arylalkenyl, arylalkoxy, arylalkyl, arylalkynyl, arylamino, arylaminocarbonyl, arylammonium, arylazo, arylcarbonyl, arylcarbonylamino, arylcarbonyloxy, arylcycloalkyl, aryloxy, aryloxyalkyl, arylsulfinyl, arylsulfinylalkyl, arylsulfonyl, arylsulfonylamino, arylthio, arylthioalkyl, cycloalkenyl, cycloalkenylalkyl, cycloalkyl, cycloalkylalkyl, cycloalkylamino, cycloalkyloxy, cycloalkynyl, cycloheteroalkyl, cycloheteroalkylalkyl, haloalkoxy, haloalkyl, heteroaryl,

heteroarylalkenyl, heteroarylalkyl, heteroarylamino, heteroarylcarbonyl, heteroarylcarbonylamino, heteroaryloxo, heteroaryloxy, heteroarylsulfinyl, heteroarylsulfonyl, heteroarylthio, polycycloalkenyl, polycycloalkenylalkyl, polycycloalkyl, polycycloalkylalkyl, and polyethylene glycol; and

where R is selected from the group consisting of hydrogen, alkenyl, alkenylaminocarbonyl, alkoxy, alkoxycarbonyl, alkyl, alkylamino, alkylaminocarbonyl, alkylammonium, alkylcarbonyl, alkylcarbonylamino, alkylcarbonyloxy, alkylsulfinyl, alkylsulfonyl, alkylthio, alkynyl, alkynylaminocarbonyl, aryl, substituted aryl, arylalkenyl, arylalkoxy, arylalkyl, arylalkynyl, arylamino, arylaminocarbonyl, arylammonium, arylazo, arylcarbonyl, arylcarbonylamino, arylcarbonyloxy, arylcycloalkyl, aryloxy, aryloxyalkyl, arylsulfinyl, arylsulfinylalkyl, arylsulfonyl, arylsulfonylamino, arylthio, arylthioalkyl, cycloalkenyl, cycloalkenylalkyl, cycloalkyl, cycloalkylalkyl, cycloalkylamino, cycloalkyloxy, cycloalkynyl, cycloheteroalkyl, cycloheteroalkylalkyl, haloalkoxy, haloalkyl, heteroaryl, heteroarylalkenyl, heteroarylalkyl, heteroarylamino, heteroarylcarbonyl, heteroarylcarbonylamino, heteroaryloxo, heteroaryloxy, heteroarylsulfinyl, heteroarylsulfonyl, heteroarylthio, polycycloalkenyl, polycycloalkenylalkyl, polycycloalkyl, polycycloalkylalkyl, and polyethylene glycol.

3. The compound of claim 1 having the structure of Formula ID or the pharmaceutically acceptable salt of said compound:



where X is A-CO-NR^1R^2;

where A is either absent or, when present, is selected from the group consisting of alkenyl, alkenylaminocarbonyl, alkoxy, alkoxycarbonyl, alkyl, alkylamino, alkylaminocarbonyl, alkylammonium, alkylcarbonyl, alkylcarbonylamino, alkylcarbonyloxy, alkylsulfinyl, alkylsulfonyl, alkylthio, alkynyl, alkynylaminocarbonyl, aryl, substituted aryl, arylalkenyl, arylalkoxy, arylalkyl, arylalkynyl, arylamino, arylaminocarbonyl, arylammonium, arylazo, arylcarbonyl, arylcarbonylamino, arylcarbonyloxy, arylcycloalkyl, aryloxy, aryloxyalkyl, arylsulfinyl, arylsulfinylalkyl,

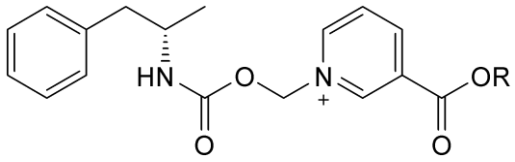
arylsulfonyl, arylsulfonylamino, arylthio, arylthioalkyl, cycloalkenyl, cycloalkenylalkyl, cycloalkyl, cycloalkylalkyl, cycloalkylamino, cycloalkyloxy, cycloalkynyl, cycloheteroalkyl, cycloheteroalkylalkyl, haloalkoxy, haloalkyl, heteroaryl, heteroarylalkenyl, heteroarylalkyl, heteroarylamino, heteroarylcarbonyl, heteroarylcarbonylamino, heteroaryloxo, heteroaryloxy, heteroarylsulfinyl, heteroarylsulfonyl, heteroarylthio, polycycloalkenyl, polycycloalkenylalkyl, polycycloalkyl, polycycloalkylalkyl, and polyethylene glycol; and

where at least one of R^1 and R^2 is hydrogen, or at least one of R^1 and R^2 comprises at least two carbons, wherein if R^1 is hydrogen or comprises at least two carbons and R^2 is selected from the group consisting of alkenyl, alkenylaminocarbonyl, alkoxy, alkoxycarbonyl, alkyl, alkylamino, alkylaminocarbonyl, alkylammonium, alkylcarbonyl, alkylcarbonylamino, alkylcarbonyloxy, alkylsulfinyl, alkylsulfonyl, alkylthio, alkynyl, alkynylaminocarbonyl, aryl, substituted aryl, arylalkenyl, arylalkoxy, arylalkyl, arylalkynyl, arylamino, arylaminocarbonyl, arylammonium, arylazo, arylcarbonyl, arylcarbonylamino, arylcarbonyloxy, arylcycloalkyl, aryloxy, aryloxyalkyl, arylsulfinyl, arylsulfinylalkyl, arylsulfonyl, arylsulfonylamino, arylthio, arylthioalkyl, cycloalkenyl, cycloalkenylalkyl, cycloalkyl, cycloalkylalkyl, cycloalkylamino, cycloalkyloxy, cycloalkynyl, cycloheteroalkyl, cycloheteroalkylalkyl, haloalkoxy, haloalkyl, heteroaryl, heteroarylalkenyl, heteroarylalkyl, heteroarylamino, heteroarylcarbonyl, heteroarylcarbonylamino, heteroaryloxo, heteroaryloxy, heteroarylsulfinyl, heteroarylsulfonyl, heteroarylthio, polycycloalkenyl, polycycloalkenylalkyl, polycycloalkyl, polycycloalkylalkyl, and polyethylene glycol,

wherein if R^2 is hydrogen or comprises at least two carbons and R^1 is independently selected from the group consisting of alkenyl, alkenylaminocarbonyl, alkoxy, alkoxycarbonyl, alkyl, alkylamino, alkylaminocarbonyl, alkylammonium, alkylcarbonyl, alkylcarbonylamino, alkylcarbonyloxy, alkylsulfinyl, alkylsulfonyl, alkylthio, alkynyl, alkynylaminocarbonyl, aryl, substituted aryl, arylalkenyl, arylalkoxy, arylalkyl, arylalkynyl, arylamino, arylaminocarbonyl, arylammonium, arylazo, arylcarbonyl, arylcarbonylamino, arylcarbonyloxy, arylcycloalkyl, aryloxy, aryloxyalkyl, arylsulfinyl, arylsulfinylalkyl, arylsulfonyl, arylsulfonylamino, arylthio, arylthioalkyl, cycloalkenyl, cycloalkenylalkyl, cycloalkyl, cycloalkylalkyl, cycloalkylamino, cycloalkyloxy, cycloalkynyl, cycloheteroalkyl, cycloheteroalkylalkyl, haloalkoxy, haloalkyl, heteroaryl, heteroarylalkenyl, heteroarylalkyl, heteroarylamino, heteroarylcarbonyl,

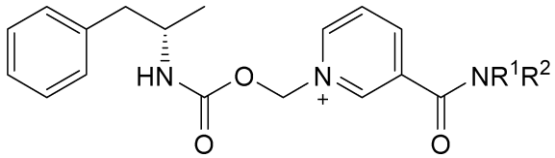
heteroarylcarbonylamino, heteroaryloxo, heteroaryloxy, heteroarylsulfinyl, heteroarylsulfonyl, heteroarylthio, polycycloalkenyl, polycycloalkenylalkyl, polycycloalkyl, polycycloalkylalkyl, and polyethylene glycol.

4. The compound of claim 2 or the pharmaceutically acceptable salt of said compound, wherein A is absent, Y is hydrogen, and the compound has the structure of formula IIB:



where R is selected from the group consisting of hydrogen, alkenyl, alkenylaminocarbonyl, alkoxy, alkoxycarbonyl, alkyl, alkylamino, alkylaminocarbonyl, alkylammonium, alkylcarbonyl, alkylcarbonylamino, alkylcarbonyloxy, alkylsulfinyl, alkylsulfonyl, alkylthio, alkynyl, alkynylaminocarbonyl, aryl, substituted aryl, arylalkenyl, arylalkoxy, arylalkyl, arylalkynyl, arylamino, arylaminocarbonyl, arylammonium, arylazo, arylcarbonyl, arylcarbonylamino, arylcarbonyloxy, arylcycloalkyl, aryloxy, aryloxyalkyl, arylsulfinyl, arylsulfinylalkyl, arylsulfonyl, arylsulfonylamino, arylthio, arylthioalkyl, cycloalkenyl, cycloalkenylalkyl, cycloalkyl, cycloalkylalkyl, cycloalkylamino, cycloalkyloxy, cycloalkynyl, cycloheteroalkyl, cycloheteroalkylalkyl, haloalkoxy, haloalkyl, heteroaryl, heteroarylalkenyl, heteroarylalkyl, heteroarylamino, heteroarylcarbonyl, heteroarylcarbonylamino, heteroaryloxo, heteroaryloxy, heteroarylsulfinyl, heteroarylsulfonyl, heteroarylthio, polycycloalkenyl, polycycloalkenylalkyl, polycycloalkyl, polycycloalkylalkyl, and polyethylene glycol.

5. The compound of claim 3 or the pharmaceutically acceptable salt of said compound, wherein A is absent, Y is hydrogen, and the compound has the structure of Formula IID:

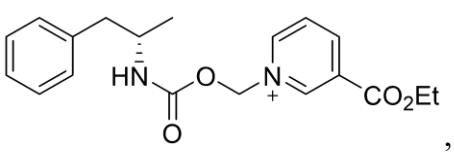
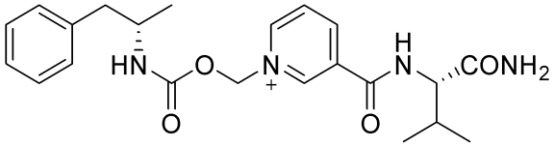
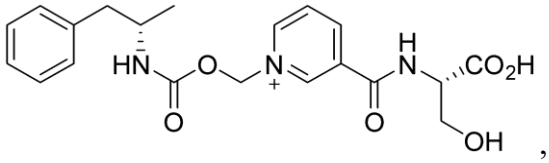
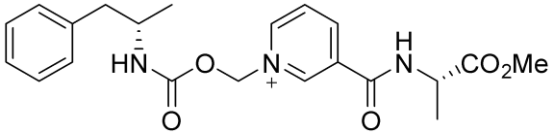
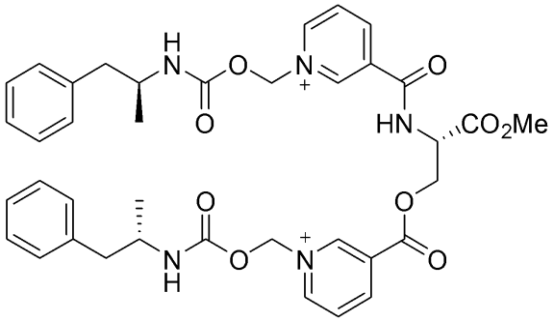


where at least one of R^1 and R^2 is hydrogen, or at least one of R^1 and R^2 comprises at least two carbons, wherein if R^1 is hydrogen or comprises at least two carbons and R^2 is selected from the group consisting of hydrogen, alkenyl, alkenylaminocarbonyl, alkoxy, alkoxycarbonyl, alkyl, alkylamino, alkylaminocarbonyl, alkylammonium, alkylcarbonyl, alkylcarbonylamino, alkylcarbonyloxy, alkylsulfinyl, alkylsulfonyl, alkylthio, alkynyl,

alkynylaminocarbonyl, aryl, substituted aryl, arylalkenyl, arylalkoxy, arylalkyl, arylalkynyl, arylamino, arylaminocarbonyl, arylammonium, arylazo, arylcarbonyl, arylcarbonylamino, arylcarbonyloxy, arylcycloalkyl, aryloxy, aryloxyalkyl, arylsulfinyl, arylsulfinylalkyl, arylsulfonyl, arylsulfonylamino, arylthio, arylthioalkyl, cycloalkenyl, cycloalkenylalkyl, cycloalkyl, cycloalkylalkyl, cycloalkylamino, cycloalkyloxy, cycloalkynyl, cycloheteroalkyl, cycloheteroalkylalkyl, haloalkoxy, haloalkyl, heteroaryl, heteroarylalkenyl, heteroarylalkyl, heteroarylamino, heteroarylcarbonyl, heteroarylcarbonylamino, heteroaryloxo, heteroaryloxy, heteroarylsulfinyl, heteroarylsulfonyl, heteroarylthio, polycycloalkenyl, polycycloalkenylalkyl, polycycloalkyl, polycycloalkylalkyl, and polyethylene glycol,

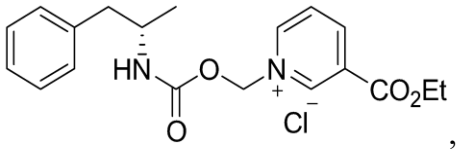
wherein if R^2 is hydrogen or comprises at least two carbons and R^1 is independently selected from the group consisting of alkenyl, alkenylaminocarbonyl, alkoxy, alkoxycarbonyl, alkyl, alkylamino, alkylaminocarbonyl, alkylammonium, alkylcarbonyl, alkylcarbonylamino, alkylcarbonyloxy, alkylsulfinyl, alkylsulfonyl, alkylthio, alkynyl, alkynylaminocarbonyl, aryl, substituted aryl, arylalkenyl, arylalkoxy, arylalkyl, arylalkynyl, arylamino, arylaminocarbonyl, arylammonium, arylazo, arylcarbonyl, arylcarbonylamino, arylcarbonyloxy, arylcycloalkyl, aryloxy, aryloxyalkyl, arylsulfinyl, arylsulfinylalkyl, arylsulfonyl, arylsulfonylamino, arylthio, arylthioalkyl, cycloalkenyl, cycloalkenylalkyl, cycloalkyl, cycloalkylalkyl, cycloalkylamino, cycloalkyloxy, cycloalkynyl, cycloheteroalkyl, cycloheteroalkylalkyl, haloalkoxy, haloalkyl, heteroaryl, heteroarylalkenyl, heteroarylalkyl, heteroarylamino, heteroarylcarbonyl, heteroarylcarbonylamino, heteroaryloxo, heteroaryloxy, heteroarylsulfinyl, heteroarylsulfonyl, heteroarylthio, polycycloalkenyl, polycycloalkenylalkyl, polycycloalkyl, polycycloalkylalkyl, and polyethylene glycol.

6. The compound of claim 1 having a structure selected from the group consisting of:

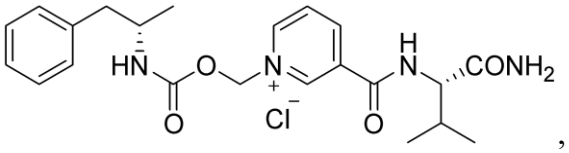

,

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,

,

and .

7. The compound of claim 1, wherein the pharmaceutically acceptable salt is selected from the group consisting of an acetate, L-aspartate, besylate, bicarbonate, carbonate, D-camsylate, L-camsylate, citrate, edisylate, formate, fumarate, gluconate, hydrobromide/bromide, hydrochloride/chloride, D-lactate, L-lactate, D,L-lactate, D,L-malate, L-malate, mesylate, pamoate, phosphate, succinate, sulfate, bisulfate, D-tartrate, L-tartrate, D,L-tartrate, meso-tartrate, benzoate, gluceptate, D-glucuronate, hybenzate, isethionate, malonate, methylsulfate, 2-napsylate, nicotinate, nitrate, orotate, stearate, tosylate, thiocyanate, acefyllinate, aceturate, aminosalicylate, ascorbate, borate, butyrate, camphorate, camphocarbonate, decanoate, hexanoate, cholate, cypionate, dichloroacetate, edentate, ethyl sulfate, furate, fusidate, galactarate, galacturonate, gallate, gentisate, glutamate, glutarate, glycerophosphate, heptanoate, hydroxybenzoate, hippurate, phenylpropionate, iodide, xinafoate, lactobionate, laurate, maleate, mandelate, methanesulfonate, myristate, napadisilate, oleate, oxalate, palmitate, picrate, pivalate, propionate, pyrophosphate, salicylate, salicylsulfate, sulfosalicylate, tannate, terephthalate, thiosalicylate, tribrophenate, valerate, valproate, adipate, 4-acetamidobenzoate, camsylate, octanoate, estolate, esylate, glycolate, thiocyanate, undecylenate, sodium, potassium, calcium, magnesium, zinc, aluminum, lithium, cholinate, lysinium, ammonium, troethamine, and a mixture thereof.

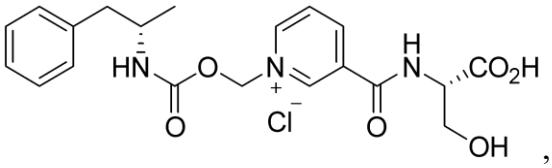
8. The compound of claim 7 having a structure selected from the group consisting of:



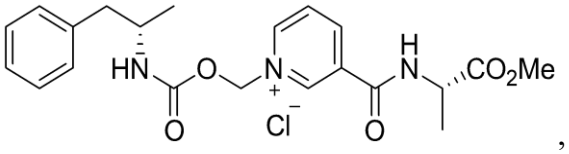
,



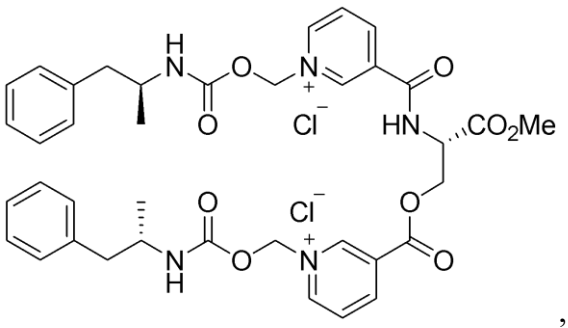
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,



,



and ,.

9. A composition comprising the compound of claim 1 or pharmaceutically acceptable salt of the compound.

10. The composition of claim 9, wherein the composition is formulated for oral administration or suppository administration.

11. The composition of claim 10, wherein the composition formulated for oral administration is in a dosage form selected from the group consisting of solid form, a tablet, a capsule, a caplet, a soft gel, a suppository, a troche, a lozenge, an oral powder, a solution, a syrup, an oral film, a thin strip, a slurry, an emulsion, an elixir, and a suspension.

12. The composition of claim 9, wherein the composition further comprises one or more excipients, wherein the excipients are selected from the group consisting of anti-adherents, binders, coatings, disintegrants, fillers, flavors, dyes, colors, glidants, lubricants, preservatives, sorbents, sweeteners, and combinations thereof.

13. The composition of claim 12, wherein the binder is selected from the group consisting of hydroxypropylmethyl cellulose, ethyl cellulose, povidone, acrylic and methacrylic acid co-polymers, pharmaceutical glaze, gums, and whey and starches.

14. The composition of claim 9, wherein the compound is present in an amount per unit dose of between 0.1 mg and 2000 mg per unit dose.

15. The composition of claim 14, wherein the compound is present in an amount per unit dose of between 0.5 mg and 500 mg per unit dose.

16. The composition of claim 15, wherein the compound is present in an amount per unit dose of between 1 mg and 250 mg per unit dose.

17. The composition of claim 16, wherein the compound is present in an amount per unit dose of between 1.5 mg and 100 mg per unit dose.

18. The composition of claim 9, wherein the composition further comprises one or more additional pharmacological substance selected from the group consisting of stimulants, anti-depressants, combinations thereof and prodrugs thereof.

19. The composition of claim 9, wherein the composition further comprises one or more of methylphenidate, aripiprazole, atomoxetine, baclofen, clonidine, desipramine, dihydrotetrabenazine, guanfacine, haloperidol, levetiracetam, mecamylamine, etoclopramide, olanzapine, ondansetron, pergolide, pimozide, pramipexole, risperidone, selegiline, sulpiride, tetrabenazine, topiramate, ziprasidone, or one or more of additional amphetamine, or any combination thereof.

20. The composition of claim 19, wherein the one or more additional amphetamine is unconjugated amphetamine, a conjugate of amphetamine, a prodrug of amphetamine, any isomer thereof, or any combination thereof.

21. The composition of claim 20, wherein the isomer of unconjugated amphetamine is unconjugated d-amphetamine.

22. The composition of claim 21, wherein the methylphenidate is unconjugated methylphenidate, a conjugate of methylphenidate, a prodrug of methylphenidate, any isomer thereof, or any combination thereof.

23. The composition of claim 22, wherein the isomer of unconjugated methylphenidate is unconjugated d-methylphenidate.

24. The composition of claim 22, wherein the conjugate of methylphenidate is serdexmethylphenidate.

25. The composition of claim 9, wherein the compound is provided in an amount sufficient to provide a decreased AUC when compared to unconjugated d-amphetamine when orally administered at equimolar doses.

26. The composition of claim 9, wherein the compound is provided in an amount sufficient to provide a decreased C_{max} as compared to unconjugated d-amphetamine when administered orally at equimolar doses.

27. The composition of claim 9, wherein the compound is provided in an amount sufficient to provide a decreased C_{max} and decreased AUC as compared to unconjugated d-amphetamine when administered orally at equimolar doses.

28. The composition of claim 9, wherein intranasal or intravenous administration of the compound provides a decreased AUC and/or C_{max} when compared to an equivalent molar amount of unconjugated d-amphetamine.

29. The composition of claim 9, wherein the compound provides reduced abuse potential as compared to unconjugated d-amphetamine.

30. A kit comprising individual doses of a therapeutically effective amount of a composition comprising the compound of claim 1, a pharmaceutical salt thereof, or a combination thereof.

31. A kit comprising individual doses of a therapeutically effective amount of a composition comprising at least one compound of claim 6, a pharmaceutical salt thereof, or a combination thereof.

32. A kit comprising individual doses of a therapeutically effective amount of a composition comprising at least one compound of claim 8, a pharmaceutical salt thereof, or a combination thereof.