Compounds having the formula

\[
\text{H} \quad \text{N} \quad \text{H} \\
\text{O} \\
\text{R}^1 \\
\text{OH} \\
\text{R}^3
\]

are methionine aminopeptidase type 2 (MetAP2) inhibitors and are useful for inhibiting angiogenesis. Also disclosed are MetAP2-inhibiting compositions and methods of inhibiting angiogenesis in a mammal.
HYDRAZIDE AND ALKOXYAMIDE ANGIOGENESIS INHIBITORS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to U.S. provisional patent application 60/197,262, filed April 14, 2000, which is hereby incorporated by reference.

TECHNICAL FIELD

The present invention relates to substituted hydrazides and N-alkoxyamides which are useful for preventing angiogenesis, methods of making the compounds, compositions containing the compounds, and methods of treatment using the compounds.

BACKGROUND OF THE INVENTION

Angiogenesis, the fundamental process by which new blood vessels are formed, is essential to a variety of normal body activities (such as reproduction, development and wound repair). Although the process is not completely understood, it is believed to involve a complex interplay of molecules which both stimulate and inhibit the growth of endothelial cells, the primary cells of the capillary blood vessels. Under normal conditions, these molecules appear to maintain the microvasculature in a quiescent state (i.e., one of no capillary growth) for prolonged periods which may last for as long as weeks or in some cases, decades. When necessary, however, (such as during wound repair), these same cells undergo rapid proliferation and turnover within a 5 day period. (The Journal of Biological Chemistry, 267:10931-10934 (1987), Science, 235:442-447 (1987)).

Although angiogenesis is a highly regulated process under normal conditions, many diseases (characterized as "angiogenic diseases") are driven by persistent unregulated angiogenesis. For example, ocular angiogenesis has been implicated as the most common cause of blindness and dominates approximately 20 eye diseases. In certain existing conditions such as arthritis, newly formed capillary blood vessels invade the joints and destroy cartilage. In diabetes, new capillaries formed in the retina invade the vitreous, bleed, and cause blindness. Growth and metastasis of solid tumors are also angiogenesis-dependent (Cancer Research, 46:467-473 (1986), Journal of the National Cancer Institute, 82:4-6 (1989). Because the pivotal role played by angiogenesis in tumor formation, metastasis, other disease conditions such as arthritis, inflammation, macular degeneration of age, and diabetic retinopathy, agents which inhibit angiogenesis have been the subject of active current research for their clinical potential.

In Proc. Natl. Acad. Sci. USA, 94:6099-6103 (1997) and Chemistry and Biology, 4(6): 461-471 (1997) it is reported that both AGM-1470 and ovalin, a squenopetene isolated from the fungus Pseudorotia oculis have been found to covalently inactivate a common bifunctional protein, type 2-methionine aminopeptidase (MetAP2) and is concluded that MetAP2 plays a critical role in the proliferation of endothelial cells and may serve as a promising target for the development of new anti-angiogenic drugs. The literature has thus established a casual link between inhibition of MetAP2 and the resultant inhibition of endothelial cell proliferation and angiogenesis. There is a need for discovery of new agents which inhibit MetAP2 for their potential as new drugs in combating angiogenesis and disease conditions which depend upon angiogenesis for their development.

SUMMARY OF THE INVENTION

In its principle embodiment, the present invention provides a compound of formula (I),

![Chemical Structure](image)

or a therapeutically acceptable salt or prodrug thereof, wherein

- $R^1$ is selected from the group consisting of alkyl, aryl, aroylalkyl, cycloalkylalkyl, (heterocycle)alkyl, and R'S-alkylene;
- wherein each group is drawn with its right-hand end being the end that is attached to the parent molecular moiety;
- $R^2$ is selected from the group consisting of hydrogen, alkyl, and aroylalkyl;
- $R^3$ is selected from the group consisting of -NR'R'', and —OR'';
- wherein each group is drawn with its left-hand end being the end that is attached to the parent molecular moiety;
- $R^4$ is selected from the group consisting of alkyl, aryl, aroylalkyl, cycloalkylalkyl, and cycloalkylsubstituted alkyl;
- $R^5$ and $R^7$ are independently selected from the group consisting of hydrogen, alkanyl, alkenyl, alkenoxyalkyl, alkoxyalkyl, alkoxyalkylalkyl, alkyl, alkylsulfanylalkyl, aryl, aryalkanoyl, arylalkoxyalkyl, arylalkoxyalkylalkyl, arylalkyl, arylalkoxyalkyl, (aryl)oyl, arylsulfonyl, carboxyalkyl, cycloalkyl, (cycloalkyl)alkyl, (cycloalkyl)alkenyl, (cycloalkyl)alkyl, haloalkanoyl, haloalkyl, heterocycle, (heterocycle)alkanoyl, (heterocycle)oyl, hydroxyalkyl, a nitrogen protecting group, and —C(O)NR''R''''10; or $R^8$ and $R^8'$ together are aryalkylidene; or
- $R^8$ and $R^8'$, together with the nitrogen atom to which they are attached, form a heterocycle;
- $R^9$ is selected from the group consisting of hydrogen, alkanoylalkyl, alkenyl, alkoxyalkylalkyl, alkyl, aminoalkyl, aryl, aryalkyl, arylalkoxy-carbonylalkyl, (aryl)oylalkyl, carbboxyalkyl, and (cycloalkyl)alkyl; and
- $R^{10}$ and $R^{10'}$ are independently selected from the group consisting of hydrogen, alkyl and aryl.
In another embodiment, the present invention provides a compound of formula (II) or a therapeutically acceptable salt or prodrug thereof, wherein \( R^1, R^2, R^8, \) and \( R^7 \) are as previously defined.

In a preferred embodiment, the present invention provides a compound of formula (II) wherein \( R^1 \) is \( R^2 \)-alkylene-, \( R^2 \) is hydrogen, one of \( R^8 \) and \( R^7 \) is hydrogen, and the other is (aryl)oyl.

In another embodiment, the present invention provides a compound of formula (III) or a therapeutically acceptable salt or prodrug thereof, wherein \( R' \) and \( R' \) are as previously defined and \( R^4 \) is selected from the group consisting of aryl, alkyl, and aryalkyl.

In another embodiment, the present invention provides a pharmaceutical composition comprising a compound of formula (I) or a therapeutically acceptable salt or prodrug thereof, in combination with a therapeutically acceptable carrier.

In another embodiment, the present invention provides a method of inhibiting angiogenesis in a mammal in a recognized need of such treatment comprising administering to the mammal a therapeutically acceptable amount of a compound of formula (I).

**DETAILED DESCRIPTION OF THE INVENTION**

Compounds of the present invention comprise hydrazines and hydroxylamines substituted with substituted 2-hydroxy-3-amino alkanolic acids.

Compounds of the present invention exist as stereoisomers, wherein asymmetric or chiral centers are present. These compounds are designated by the symbols “R” or “S” depending on the configuration of substituents around the chiral carbon atom. The present invention contains various stereoisomers and mixtures thereof. Stereoisomers include enantiomers and diastereomers, and mixtures of enantiomers or diastereomers are designated (RS).

Individual stereoisomers of compounds of the present invention may be prepared synthetically from commercially available starting materials which contain asymmetric or chiral centers or by preparation of racemic mixtures followed by resolution well-known to those of ordinary skill in the art. These methods of resolution are exemplified by (1) attachment of a mixture of enantiomers to a chiral auxiliary, separation of the resulting mixture of diastereomers by recrystallization or chromatography and liberation of the optically pure product from the auxiliary or (2) direct separation of the mixture of optical enantiomers on chiral chromatographic columns.

Because carbon-carbon double bonds may exist in the present compounds, the invention contemplates various geometric isomers and mixtures thereof resulting from the arrangement of substituents around these carbon-carbon double bonds. These substituents are designated as being in the E or Z configuration wherein the term “E” represents higher order substituents on opposite sides of the carbon-carbon double bond, and the term “Z” represents higher order substituents on the same side of the carbon-carbon double bond.

When used throughout this specification and the appended claims, the following terms have the meanings indicated:

- The term “alkanoyl” refers to an alkyl group attached to the parent molecular moiety through a carbonyl group. The alkanoyl groups of this invention can be unsubstituted or substituted with one, two, or three substituents independently selected from the group consisting of alkoxycarbonyl, alkylsulfanyl, amino, and hydroxy.

- The term “alkanoylalkyl” refers to an alkanoyl group attached to the parent molecular moiety through an alkyl group.

- The term “alkenyl” refers to a monovalent straight or branched chain groups having from two to fourteen carbon atoms containing at least one carbon-carbon double bond.

- The term “alkenlyoxy” refers to an alkenyl group attached to the parent molecular moiety through an oxygen atom.

- The term “alkenlyxyalkyl” refers to an alkenlyoxy group attached to the parent molecular moiety through an alkyl group.

- The term “alkoxy” refers to an alkyl group attached to the parent molecular moiety through an oxygen atom.

- The term “alkoxyalkyl” refers to an alkoxy group attached to the parent molecular moiety through an alkyl group.

- The term “alkoxyacarbonyl” refers to an alkoxy group attached to the parent molecular moiety through a carbonyl group.

- The term “alkoxycarbonylalkyl” refers to an alkoxy carbonyl group attached to the parent molecular moiety through an alkyl group.

- The term “alkyl” refers to a monovalent group derived from a straight or branched chain saturated hydrocarbon having from one to fourteen carbons by the removal of a single hydrogen atom.
0039 The term “alkylene” refers to a saturated divalent hydrocarbon group derived from a straight or branched chain saturated hydrocarbon having from one to fourteen carbons by the removal of two hydrogen atoms.

0040 The term “alkylsulfanyl” refers to an alkyl group attached to the parent molecular moiety through a sulfur atom.

0041 The term “alkylsulfonylmalkyl” refers to an alkylsulfanyl group attached to the parent molecular moiety through an alkyl group.

0042 The term “alkylsulfonyl” refers to an alkyl group attached to the parent molecular moiety through a sulfonfyl group.

0043 The term “amido” refers to an amino group attached to the parent molecular moiety through a carbonyl group.

0044 The term “amidoalkyl” refers to an amido group attached to the parent molecular moiety through an alkyl group.

0045 The term “amino” refers to —NR R', wherein R' and R are independently selected from the group consisting of hydrogen, unsubstituted alkanoyl, alkoxy carbonylalkyl, alkyl, aryl, aralkyl, (aryloxy)cycloalkyl, and (cycloalkyl)alkyl. The aryl and the aryl part of the arylalkyl and the (aryloxy)alkyl can be unsubstituted or substituted with one, two, three, four, or five substituents independently selected from the group consisting of alkoxy, alkoxy carbonyl, cyano, halo, haloalkoxy, haloalkyl, and nitro.

0046 The term “aminoalkoxy” refers to an amino group attached to the parent molecular moiety through an alkoxy group.

0047 The term “aminoalkyl” refers to an amino group attached to the parent molecular moiety through an alkyl group.

0048 The term “aminosulfonyl” refers to an amino group attached to the parent molecular moiety through a sulfonfyl group.

0049 The term “aryl” refers to phenyl, naphthyl, dihydro naphthyl, tetrahydro naphthyl, indanyl, and indenyl. Aryl groups having an unsaturated or partially saturated ring fused to an aromatic ring can be attached through either the saturated or unsaturated part of the group. The aryl groups of this invention can be unsubstituted or substituted with one, two, three, four, or five substituents independently selected from the group consisting of alkanoyl, alkoxy, alkoxy alkyl, alkoxy carbonyl alkyl, alkyl, alkoxy sulfanyl, alkyl sulfanyl alkyl, amino, amino alkoxy, amino alkyl, aminosulfonyl, carboxy, cyano, (cycloalkyl) alkoxy sulfanyl, cycloalkyl sulfanyl, halo, haloalkoxy, haloalkyl, haloalkyl sulfanyl, (heterocycle) alkanyl, hydroxy, hydroxalkoxy, nitro, o xo, and thioxo. The aryl groups of this invention can be further substituted with an additional aryl group or an aryl alkyl, aryl alkoxy sulfanyl, aryl oxy, aryl oxy alkyl, heterocycle, or (heterocycle) alkanyl group, wherein the aryl, the aryl part of the aryl alkyl, the aryl alkoxy sulfanyl, the aryl oxy, and the aryl oxy alkyl, the heterocycle, and the heterocycle part of the (heterocycle) alkanyl can be further substituted with one, two, three, four, or five substituents independently selected from the group consisting of alkanoyl, alkoxy, alkoxy carbonyl, alkyl, carboxy, cyano, haloalkoxy, haloalkyl, and nitro.

0050 The term “arylanonyl” refers to an aryl group attached to the parent molecular moiety through an alkoxy group.

0051 The term “arylalkoxy” refers to an aryl group attached to the parent molecular moiety through an alkoxy group.

0052 The term “arylalkoxyalkyl” refers to an arylalkoxy group attached to the parent molecular moiety through an alkyl group.

0053 The term “arylalkoxy carbonyl” refers to an arylalkoxy group attached to the parent molecular moiety through a carbonyl group.

0054 The term “arylalkoxy carboxy alkyl” refers to an arylalkoxy carbonyl group attached to the parent molecular moiety through an alkyl group.

0055 The term “arylalkyl” refers to an aryl group attached to the parent group through an alkyl group. The alkyl part of the arylalkyl can be unsubstituted or substituted with a cyano group.

0056 The term “arylalkylidene” refers to —CHRC, wherein R is aryl.

0057 The term “arylsulfonyl” refers to an arylalkyl group attached to the parent molecular moiety through a sulfur atom.

0058 The term “aryloxy” refers to an aryl group attached to the parent molecular moiety through an oxygen atom.

0059 The term “aryloxy alkyl” refers to an aryl oxy group attached to the parent molecular moiety through an alkyl group. The alkyl part of the aryloxy alkyl can be unsubstituted or substituted with a hydroxy group.

0060 The term “aryl” refers to an aryl group attached to the parent molecular moiety through a carbonyl group.

0061 The term “aryloxyalkyl” represents an (aryl)oxy group attached to the parent molecular moiety through an alkyl group.

0062 The term “arylsulfonyl” refers to an aryl group attached to the parent molecular moiety through a sulfonfyl group.

0063 The term “carbonyl” refers to —(O)—.

0064 The term “carboxy” refers to —CO.H.

0065 The term “carboxy alkyl” refers to a carboxy group attached to the parent molecular moiety through an alkyl group.

0066 The term “cyano” refers to —CN.

0067 The term “cycloalkyl” refers to a monovalent saturated cyclic hydrocarbon having from three to ten carbon atoms.

0068 The term “cycloalkylalkanoyl” refers to a cycloalkyl group attached to the parent molecular moiety through an alkanoyl group.
The term “(cycloalkyl)alkyl” refers to a cycloalkyl group attached to the parent molecular moiety through an alkyl group.

The term “(cycloalkyl)alkylsulfanyl” refers to a cycloalkylalkyl group attached to the parent molecular moiety through a sulfur atom.

The term “(cycloalkyl)oyl” refers to a cycloalkyl group attached to the parent molecular moiety through a carbonyl group.

The term “cycloalkylsulfanyl” refers to a cycloalkyl group attached to the parent molecular moiety through a sulfur atom.

The term “halo” or “halogen” refers to F, Cl, Br, or I.

The term “haloalkanoyl” refers to a haloalkyl group attached to the parent molecular moiety through a carbonyl group.

The term “haloalkoxy” refers to a haloalkyl group attached to the parent molecular moiety through an oxygen atom.

The term “haloalkyl” refers to an alkyl group substituted by one, two, three, or four halogen atoms.

The term “haloalkylsulfanyl” refers to a haloalkyl group attached to the parent molecular moiety through a sulfur atom.

The term “heterocycle” refers to a five-, six- or seven-membered ring containing one, two or three heteroatoms independently selected from the group consisting of nitrogen, oxygen and sulfur. The five-membered ring has zero to two double bonds and the six- and seven-membered rings have zero to three double bonds. The term “heterocycle” also includes bicyclic groups in which the heterocycle ring is fused to a phenyl group or a cycloalkyl group.

The heterocyclic groups of the present invention can be attached through a carbon atom or a nitrogen atom in the group. Examples of heterocycles include, but are not limited to, benzodioxolyl, benzoazolyl, benzothienyl, chromenyl, dihydroxydiazinyl, furyl, isoxazolyl, morpholinyl, piperazinyl, piperidinyl, pyrazinyl, pyrazolyl, pyridazinyl, pyridinyl, pyrimidinyl, pyrrolidinyl, pyrrolyl, quinolinyl, quinoloxoliny, tetrazidobenzothienyl, tetrahydrofuranyl, thiazolidinyl, thiazolyl, thienyl, and the like. The heterocyclic groups of this invention can be unsubstituted or substituted with one, two, three, or four substituents independently selected from the group consisting of alkoxyl, alkoxyalkyl, alkoxyalkylalkyl, alkyl, alkylsulfanyllakyl, amino, aminosulfonfyl, carboxy, halo, haloalkoxy, haloalkyl, hydroxy, nitro, oxo, and thioxo.

The heterocyclic groups of this invention can be further substituted with an aryl, aryalkyl, aryloxy, aryloxyalkyl, or (heterocycle)alkenyl group, wherein the aryl, the aryl portion of the aryl, the aryl portion of the aryloxy, the arylalkyl, and the aryloxyalkyl, and the heterocycle portion of the heterocycle)alkenyl can be further substituted with one, two, three, four, or five substituents independently selected from the group consisting of alkyl, alkoxy, alkoxyalkylalkyl, alkyl, carboxy, cyan, haloalkoxy, haloalkyl, and nitro.

The term “(heterocycle)alkanoyl” refers to a heterocyclic group attached to the parent molecular moiety through an alkenyl group.

The term “(heterocycle)alkyl” refers to a heterocyclic group attached to the parent molecular moiety through an alkyl group.

The term “(heterocycle)oyl” refers to a heterocyclic group attached to the parent molecular moiety through a carbonyl group.

The term “hydroxy” refers to —OH.

The term “hydroxyalkoxy” refers to a hydroxyalkyl group attached to the parent molecular moiety through an oxygen atom.

The term “hydroxyalkyl” refers to an alkyl group substituted with one, two, or three hydroxy groups.

The term “nitro” refers to —NO₂.

The term “nitrogen protecting group” refers to groups intended to protect an amino group against undesirable reactions during synthetic procedures. Common N-protecting groups comprise acyl groups such as formyl, acetyl, propionyl, pivaloyl, tert-butylacetyl, 2-chloroacetyl, 2-bromocacetyl, trifluoroacetyl, trichloroacetyl, phthalyl, ortho-nitrophenyloxycarbonyl, α-chlorobutryl, benzoyl, 4-chlorobenzoyl, 4-bromobenzoyl, and 4-nitrobenzoyl; sulfonl groups such as benzenesulfonyl, and para-toluencesulfonyl; carbamate forming groups such as benzylloxycarbonyl, para-chlorobenzoylcarbonyl, p-methoxybenzoylcarbonyl, tert-butylxycarbonyl (Boe), benzoylcarbonyl (Cbz), and the like.

The term “oxo” refers to (=O).

The term “sulfonyl” refers to —SO₂—.

The term “thioxo” refers to (=S).

The compounds of the present invention can exist as therapeutically acceptable salts. The term “therapeutically acceptable salt,” as used herein, represents salts or zwitterionic forms of the compounds of the instant invention which are water or oil-soluble or dispersible, which are suitable for treatment of diseases without undue toxicity, irritation, and allergic response; which are commensurate with a reasonable benefit/risk ratio, and which are effective for their intended use. The salts can be prepared during the final isolation and purification of the compounds or separately by reacting an amino group with a suitable acid. Representative acid addition salts include acetate, adipate, alginic, citrate, aspartate, benzoate, benzenesulfonate, bisulfate, butyrate, camphorate, camphorsulfonate, diglucoconate, glycyrophosphate, hemisulfate, heptanoate, hexanoate, formate, fumarate, hydrochloride, hydrobromide, hydroiodide, 2-hydroxyethansulfonate (selseionate), lactate, maleate, mesylatesulfonate, methanesulfonate, naphthyl- enesulfonate, nicotinate, 2-naphthalenesulfonate, oxalate, pamoate, pectinate, persulfate, 3-phenylpropionate, pivate, pivalate, propionate, succinate, tarteate, trichloroacetate, trifluoroacetate, phosphate, glutamate, bicarbonate, para-toluencesulfonate, and undecanoate. Also, amino groups in the compounds of the present invention can be quaternized with methyl, ethyl, propyl, and butyl chlorides, bromides, and iodides; dimethyl, diethyl, dibutyl, and diamyl sulfates; decyl, lauryl, myristyl, and steryl chlorides, bromides, and
iodides; and benzyl and phenethyl bromides. Examples of acids which can be employed to form therapeutically acceptable addition salts include inorganic acids such as hydrochloric, hydrobromic, sulfuric, and phosphoric, and organic acids such as oxalic, maleic, succinic, and citric.

[0092] Basic addition salts can be prepared during the final isolation and purification of the compounds by reacting a carboxy group with a suitable base such as the hydroxide, carbonate, or bicarbonate of a metal cation or with ammonia or an organic primary, secondary, or tertiary amine. The cations of therapeutically acceptable salts include lithium, sodium, potassium, calcium, magnesium, and aluminum, as well as nontoxic quaternary amine cations such as ammonium, tetramethylammonium, tetraethylammonium, methylamine, dimethylamine, trimethylamine, triethylamine, diethylamine, ethylamine, tributylamine, pyridine, N,N-dimethylamine, N-methylpyrrolidine, N-methylmorpholine, dicyclohexylamine, procaine, dibenzylamine, N,N-dibenzyl-phenethylamine, 1-ephenamine, and N,N'-dibenzylethlenediamine. Other representative organic amines useful for the formation of base addition salts include ethylenediamine, ethanolamine, diethanolamine, piperidine, and piperazone.

[0093] The present compounds can also exist as therapeutically acceptable prodrugs. The term “therapeutically acceptable prodrug,” refers to those prodrugs or zwitterions which are suitable for use in contact with the tissues of patients without undue toxicity, irritation, and allergic response, are commensurate with a reasonable benefit/risk ratio, and are effective for their intended use. The term “prodrug,” refers to compounds which are rapidly transformed in vivo to parent compounds of formula (I) for example, by hydrolysis in blood.

[0094] In accordance with methods of treatment and pharmaceutical compositions of the invention, the compounds can be administered alone or in combination with other anti-angiogenesis agents. When using the compounds, the specific therapeutically effective dose level for any particular patient will depend upon factors such as the disorder being treated and the severity of the disorder; the activity of the particular compound used; the specific composition employed; the age, body weight, general health, sex, and diet of the patient; the time of administration; the route of administration; the rate of excretion of the compound employed; the duration of treatment; and drugs used in combination or coincidentally with the compound used. The compounds can be administered orally, parenterally, osmotically (nasal sprays), rectally, vaginally, or topically in unit dosage formulations containing carriers, adjuvants, diluents, vehicles, or combinations thereof. The term “parenteral” includes infusion as well as subcutaneous, intravenous, intramuscular, and intratracheal injection.

[0095] Parenterally administered aqueous or oleaginous suspensions of the compounds can be formulated with dispersing, wetting, or suspending agents. The injectable preparation can also be an injectable solution or suspension in a diluent or solvent. Among the acceptable diluents or solvents employed are water, saline, Ringer’s solution, buffers, monoglycerides, diglycerides, fatty acids such as oleic acid, and fixed oils such as monoglycerides or diglycerides.

[0096] The anti-angiogenesis effect of parenterally administered compounds can be prolonged by slowing their absorption. One way to slow the absorption of a particular compound is administering injectable depot forms comprising suspensions of crystalline, amorphous, or otherwise water-insoluble forms of the compound. The rate of absorption of the compound is dependent on its rate of dissolution which is, in turn, dependent on its physical state. Another way to slow absorption of a particular compound is administering injectable depot forms comprising the compound as an oleaginous solution or suspension. Yet another way to slow absorption of a particular compound is administering injectable depot forms comprising microcapsule matrices of the compound trapped within liposomes, microemulsions, or biodegradable polymers such as poly(lactic-co-glycolic) acid or polyesters or polyanhydrides. Depending on the ratio of drug to polymer and the composition of the polymer, the rate of drug release can be controlled.

[0097] Transdermal patches can also provide controlled delivery of the compounds. The rate of absorption can be slowed by using rate controlling membranes or by trapping the compound within a polymer matrix or gel. Conversely, absorption enhancers can be used to increase absorption.

[0098] Solid dosage forms for oral administration include capsules, tablets, pills, powders, and granules. In these solid dosage forms, the active compound can optionally comprise diluents such as sucrose, lactose, starch, talc, silicic acid, aluminum hydroxide, calcium silicates, polyamide powder, tableting lubricants, and tableting aids such as magnesium stearate or microcrystalline cellulose. Capsules, tablets and pills can also comprise buffering agents, and tablets and pills can be prepared with enteric coatings or other release controlling coatings. Powders and sprays can also contain excipients such as talc, silicic acid, aluminum hydroxide, calcium silicate, polyelelymide powder, or mixtures thereof. Sprays can additionally contain customary propellants such as chlorofluorohydrocarbons or substitutes therefor.

[0099] Liquid dosage forms for oral administration include emulsions, microemulsions, solutions, suspensions, syrups, and elixirs comprising inert diluents such as water. These compositions can also comprise adjuvants such as wetting, emulsifying, suspending, sweetening, flavoring, and perfuming agents.

[0100] Topical dosage forms include ointments, pastes, creams, lotions, gels, powders, solutions, sprays, inhalants, and transdermal patches. The compound is mixed under sterile conditions with a carrier and any needed preservatives or buffers. These dosage forms can also include excipients such as animal and vegetable fats, oils, waxes, paraffins, starch, tragacanth, cellulose derivatives, polyethylene glycols, silicones, bentonites, silicic acid, and zinc oxide, or mixtures thereof. Suppositories for rectal or vaginal administration can be prepared by mixing the compounds with a suitable non-irritating excipient such as cocoa butter or polyethylene glycol, each of which is solid at ordinary temperature but fluid in the rectum or vagina. Ophthalmic formulations comprising eye drops, eye ointments, powders, and solutions are also contemplated as being within the scope of this invention.

[0101] The total daily dose of the compounds administered to a host in single or divided doses can be in amounts from about 0.1 to about 200 mg/kg body weight or preferably from about 0.25 to about 100 mg/kg body weight. Single dose compositions can contain these amounts or submultiples thereof to make up the daily dose.
DETERMINATION OF BIOLOGICAL ACTIVITY

[0102] Assays for the inhibition of catalytic activities of MetAP2 were performed in 96-well microtiter plates. Compounds to be tested were dissolved in dimethyl-sulfoxide at 10 mM and diluted ten-fold in assay buffer (50 mM HEPES, pH 7.4, 100 mM NaCl). Ten microliters of solution of each compound to be tested for inhibition were introduced into each cell of the plate. Zero inhibition of enzyme activity was taken to be the result obtained in cells in which 10 mL of assay buffer was placed. A mixture totaling 90 mL per well and made up of 84 mL of assay buffer containing 100 mM MnCl₂, 1 mL of L-amino acid oxidase (Sigma Catalog No. A-9378, –11 mg/mL), 1 mL of horseradish peroxidase (Sigma Catalog No. P-8451, dissolved in assay buffer at a concentration of 10 mg/mL), 1 mL of the tripeptide Met-Ala-Ser (Bachem) dissolved in assay buffer at concentration of 50 mM, 1 mL of ortho-dianisidine (Sigma Catalog No. D-1954, freshly made solution in water at a concentration of 10 mg/mL), and MetAP1 at final concentration of 6 mg/mL or MetAP2 at a final concentration of 1.5 mg/mL was rapidly mixed and added to each cell containing test or control compound. The absorbence at 450 nanometers was measured every 20 seconds over a period of twenty minutes using an automatic plate reader (Molecular Devices, CA, USA). The V_{max} in mOD/min, calculated for each well, was used to represent MetAP1 or MetAP2 activity. The IC₅₀ for each inhibitor was obtained by plotting the remaining activity versus inhibitor concentrations. All of the compounds of the invention displayed IC₅₀’s below 15 μM. Preferred compounds of the invention displayed IC₅₀’s below 1 μM, and most preferred compounds displayed IC₅₀’s below 0.1 μM. Thus, the compounds are useful for treating diseases caused or exacerbated by angiogenesis.

SYNTHETIC METHODS

[0103] Abbreviations which have been used in the descriptions of the scheme and the examples that follow are: THF for tetrahydrofuran, PDC for pyridinium dichromate, DMSO for dimethylsulfoxide, DME for 1,2-dimethoxyethane, DCC for 1,3-dicyclohexycarbodiimide, DIC for 1,3-diisopropylcarbodiimide, HOBT for 1-hydroxybenzotriazole, HOAT for 1-hydroxy-7-azabenzotriazole, EDCI for 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide hydrochloride, PyBOP for benzotriazol-1-yl-oxytripyrrolidino phosphonium hexafluorophosphate, DBU for 1,8-diazabicyclo(5.4.0)undec-7-ene, NMM for N-methylmorpholine, DMA for N,N-dimethylacetamide, NMP for N-methylpyrrolidinone, BOC-ON for (2-tetrahydroxyamino)-2-phenylacetonitrile, and DMF for N,N dimethylformamide.

[0104] The compounds and processes of the present invention will be better understood in connection with the following synthetic schemes which illustrate the methods by which the compounds of the invention may be prepared. Starting materials can be obtained from commercial sources or prepared by well-established literature methods known to those of ordinary skill in the art. The groups R², R³, R⁴, R⁵, and R⁶ are defined above. It will be readily apparent to one of ordinary skill in the art that the compounds defined above can be synthesized by substitution of the appropriate reactants and agents in the syntheses shown below.

![Scheme 1](image)

[0105] As shown in Scheme 1, compounds of formula (1) (R² is a nitrogen protecting group) can be converted to compounds of formula (2) by treatment with a reducing agent. Representative reducing agents include sodium borohydride, calcium borohydride, lithium borohydride, zinc borohydride, lithium aluminum hydride, borane, sodium cyanoborohydride, diisobutyaluminum hydride, and sodium bis(2-methoxyethoxy)aluminum hydride (Red-Al®). Examples of solvents used in these reactions include toluene, dichloromethane, ethanol, THF, dioxane, diethyl ether, or mixtures thereof. The reaction temperature is about 27°C to 60°C and depends on the method chosen. Reaction times are typically about 0.5 to 24 hours.

[0106] Compounds of formula (2) can be converted to compounds of formula (3) by treatment with an oxidizing reagent. Representative oxidizing agents include Dess-Mar
DMSO/SO₂-pyridine/triethylamine. Examples of solvents used in these reactions include DMSO, dichloromethane, chloroform, and THF. The reaction temperature is about -78° C to 60° C and depends on the method chosen. Reaction times are typically about 0.5 to 24 hours.

[0107] Conversion of compounds of formula (3) to compounds of formula (4) can be accomplished by the addition of sodium bisulfite, followed by the addition of sodium cyanide or potassium cyanide. Examples of solvents used in these reactions include water, ethyl acetate, and acetonitrile. The reaction temperature is about -10° C to 60° C and depends on the method chosen. Reaction times are typically about 2-36 hours.

[0108] Compounds of formula (4) can be converted to compounds of formula (5) by hydrolysis with aqueous acid or by hydrolysis with aqueous base followed by acidification. Representative aqueous acids include HBr, HCl, HOAc, and H₂SO₄, and representative aqueous bases include NaOH, KOH, and Ba(OH)₂. Examples of solvents used in these reactions include dioxane, water, ethylene glycol, and DME. The reaction temperature is about 25° C to 150° C and depends on the method chosen. Reaction times are typically about 2-36 hours.

[0109] Conversion of compounds of formula (5) to compounds of formula (6) can be accomplished by coupling with substituted hydrazines (HNR₂NR'R²) in the presence of a carbonyl activating group such as DCC, DIC, HOBT, HOAT, EDCI, and PyBOP, and base. Representative bases include NMM, diisopropylethylamine, and DBU. Examples of solvents used in these reactions include dichloromethane, chloroform, DMA, THF, and NMP. The reaction temperature is about -10° C to 60° C and depends on the method chosen. Reaction times are typically about 2-72 hours.

[0110] A method for the preparation of compounds of formula (11) is shown in Scheme 2. Aldehydes of formula (7) can be reacted with compounds of formula (8) (R² is alkyl or arylalkyl) in the presence of a base and lithium bromide to provide compounds of formula (9). Examples of bases include triethylamine and diisopropylethylamine. Representative solvents include THF, diethyl ether, and methyl tert-butyl ether. The reaction is conducted at about 25 to about 30° C for about 12 to about 24 hours.

[0111] Compounds of formula (9) can be treated with an appropriately substituted amine or amide in the presence of tert-butyllithium and base, then treated with potassium osmate dihydrate and hydroquinone dine 1:4-phthalalazinediyldiether to provide compounds of formula (10) (R² is a nitrogen protecting group). Examples of bases include sodium hydride, potassium hydride, and lithium hydride. Representative solvents include water, 1-propanol, isoamyl alcohol, acetonitrile, and mixtures thereof. The reaction is typically conducted at about 0 to about 30° C for about 30 minutes to about 4 hours.

[0112] Conversion of compounds of formula (10) to compounds of formula (5) can be accomplished by treatment with hydrogen peroxide in the presence of hydroxide such as lithium hydroxide. Examples of solvents include THF, water, and mixtures thereof. The reaction is conducted at about 0 to about 25° C for about 1 to about 6 hours.

[0113] Compounds of formula (5) can be converted to compounds of formula (12) (R is aryl, arylalkyl, cycloalkyl, cycloalkylalkyl, heterocyclic, or (heterocycle)alkyl) either by the methods described in Schemes 1 and 3, or by sequentially coupling the carboxylic acid with hydrazine and then coupling with an appropriately substituted carboxylic acid. Conditions for these couplings are similar to those described in Scheme 1 and are known to those of ordinary skill in the art.

Scheme 2
EXAMPLE 1B
tert-butyl (1R)-2-cyclohexyl-1-formylethylcarbamate

[0118] A solution of Example 1A (25.8 g, 100 mmol), sulfur trioxide pyridine complex (79.6 g, 500 mmol), and triethylamine (69.7 mL, 500 mmol) in DMSO (70 mL) at room temperature was stirred for 30 minutes, cooled to 0°C, treated with water and saturated aqueous KHSO₄, and extracted with ethyl acetate. The extract was washed with saturated aqueous KHSO₄ and brine, dried (MgSO₄), filtered, and concentrated to provide the desired product.

EXAMPLE 1C
(2RS,3R)-3-(tert-butoxycarbonylamino)-4-cyclohexyl-2-hydroxybutanoic acid

[0119] A solution of Example 1B (19.7 g, 77.1 mmol) and sodium bisulfite (8.0 g, 77.1 mmol) in water (500 mL) at 5°C was stirred for 24 hours, warmed to room temperature, treated with a solution of potassium cyanide (5.1 g, 78.8 mmol) in ethyl acetate (350 mL), and stirred for 5 hours. The aqueous phase was separated and extracted with ethyl acetate. The combined extracts were washed with water and brine, dried (MgSO₄), filtered, and concentrated to provide tert-butyl (1R)-2-cyano-1-(cyclohexylmethyl)-2-hydroxyethylcarbamate.

[0120] The concentrate was dissolved in dioxane (150 mL), treated with 12N HCl (150 mL), heated to reflux, stirred for 21 hours, and cooled to room temperature. The mixture was concentrated, dissolved in a mixture of water (30 mL) and acetone (200 mL), adjusted to pH 5.5 with 1N NaOH, treated with acetone (3.5 L), and cooled to 0°C for 4 hours. The resulting precipitate was collected by filtration and dried to provide (3R)-3-amino-4-cyclohexyl-2-hydroxybutanoic acid. A solution of the acid, BOC-ON (1.2 eq.), and triethylamine (2 eq.) in 1:1 water/dioxane at 45°C was stirred for 15 hours, treated with 10% aqueous KHSO₄, and extracted with ethyl acetate. The extract was washed with water and brine, dried (MgSO₄), filtered, and concentrated to provide the desired product.

EXAMPLE 1D
(2RS,3R)-3-amino-N'-benzyl-4-cyclohexyl-2-hydroxybutanoic hydrazide

[0121] A solution of Example 1C (50 mg, 0.17 mmol), 1-hydroxybenzotriazole hydrate (30 mg, 0.22 mmol), and N-methylmorpholine (0.07 mL, 0.63 mmol) in 5:1 dichloromethane:N,N-dimethylacetamide (2 mL) at 0°C was treated with 1,3-diisopropylcarbodiimide (0.03 mL, 0.21 mmol), and stirred for 5 minutes. The solution was treated with 1-benzhydrylamine dihydrochloride (0.05 g, 0.25 mmol), stirred for 2 hours, and warmed to room temperature over 44 hours. The reaction was washed with 2N HCl and saturated NaHCO₃, and concentrated. The concentrate was purified by silica gel chromatography with 3:1 hexanese:ethyl acetate then 1:1 hexanese:ethyl acetate, then dissolved in 4N HCl in dioxane (1 mL), stirred for 1 hour, and concentrated, then purified by HPLC to provide the desired product.

[0122] MS(APCI) m/e 306 (M+H)⁺
EXAMPLE 2
(2R,3R)-3-amino-N-benzyl-4-cyclohexyl-2-hydroxybutanohydrazide

[0124] The desired product was prepared by substituting diphenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0125] MS(APCI) m/e 368 (M+H)+;

[0126] 'H NMR (300 MHz, CD3OD) δ 7.43-7.26 (m, 5H), 4.13 (d, 1H), 4.01 (s, 2H), 3.53 (m, 1H), 3.39 (s, 1H), 1.80-1.67 (m, 5H), 1.57-1.51 (m, 1H), 1.46-1.17 (m, 5H), 1.00-0.90 (m, 2H).

EXAMPLE 3
(2R,3R)-3-amino-N-(7-chloro-4-quinolinyl)-4-cyclohexyl-2-hydroxybutanohydrazide

[0127] The desired product was prepared by substituting 7-chloro-4-quinolino-n for 1-benzylhydrazine dihydrochloride in Example 1.

[0128] MS(APCI) m/e 377 (M+H)+;

[0129] 'H NMR (300 MHz, CD3OD) δ 8.51 (d, 1H), 8.35 (d, 1H), 7.96 (d, 1H), 7.76 (dd, 1H), 6.96 (d, 1H), 4.47 (d, 1H), 3.70 (m, 1H), 1.86-0.98 (m, 13H).

EXAMPLE 4
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N-(2-phenylethyl)butanohydrazide

[0130] The desired product was prepared by substituting 1-(2-phenethyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0131] MS(APCI) m/e 320 (M+H)+;

[0132] 'H NMR (300 MHz, CD3OD) δ 7.30-7.21 (m, 5H), 4.16 (d, 1H), 3.59 (m, 1H), 3.09 (t, 2H), 2.82 (t, 2H), 1.81-0.91 (m, 13H).

EXAMPLE 5
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N-methyl-N-phenylbutanohydrazide

[0133] The desired product was prepared by substituting 1-methyl-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0134] MS(APCI) m/e 306 (M+H)+;

[0135] 'H NMR (300 MHz, CD3OD) δ 7.21-7.26 (m, 2H), 6.82-6.91 (m, 3H), 4.28 (d, 1H), 3.63 (m, 1H), 3.16 (s, 3H), 1.68-1.88 (m, 6H), 1.48-1.58 (m, 2H), 1.19-1.38 (m, 3H), 0.92-1.08 (m, 2H).

EXAMPLE 6
N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl-1-naphthohydrazide

[0136] The desired product was prepared by substituting 1-naphthohydrazide for 1-benzylhydrazine dihydrochloride in Example 1.

[0137] MS(APCI) m/e 370 (M+H)+;

[0138] 'H NMR (300 MHz, CD3OD) δ 8.37 (m, 1H), 8.05 (d, 1H), 7.95 (m, 1H), 7.77 (dd, 1H), 7.57 (m, 3H), 4.42 (d, 1H), 3.77 (m, 1H), 1.90-0.97 (m, 13H).

EXAMPLE 7
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N’-(4-methylphenyl)butanohydrazide

[0139] The desired product was prepared by substituting 1-(4-methylphenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0140] MS(APCI) m/e 306 (M+H)+;

[0141] 'H NMR (300 MHz, CD3OD) δ 7.01 (d, 2H), 6.76 (d, 2H), 4.27 (d, 1H), 3.61 (m, 1H), 2.23 (s, 3H), 1.85-1.64 (m, 6H), 1.54-1.42 (m, 2H), 1.36-1.15 (m, 3H), 1.06-0.89 (m, 2H).

EXAMPLE 8
2-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-N’-(4-isodophenyl)hydrazinecarboxamide

[0142] The desired product was prepared by substituting N-(4-isodophenyl)hydrazinecarboxamide for 1-benzylhydrazine dihydrochloride in Example 1.

[0143] MS(APCI) m/e 461 (M+H)+;

[0144] 'H NMR (300 MHz, CD3OD) δ 7.59 (d, 2H), 7.23 (d, 2H), 4.33 (d, 1H), 3.68 (m, 1H), 1.85-1.65 (m, 6H), 1.59-1.19 (m, 5H), 1.09-0.93 (m, 2H).

EXAMPLE 9
N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,4,6-trimethylbenzenesulfonohydrazide

[0145] The desired product was prepared by substituting 2,4,6-trimethylbenzenesulfonohydrazide for 1-benzylhydrazine dihydrochloride in Example 1.

[0146] MS(APCI) m/e 398 (M+H)+;

[0147] 'H NMR (300 MHz, CD3OD) δ 7.01 (s, 2H), 4.01 (d, 1H), 3.36 (m, 1H), 2.67 (s, 6H), 2.29 (s, 3H), 1.78-1.65 (m, 4H), 1.47-1.20 (m, 7H), 1.00-0.78 (m, 2H).

EXAMPLE 10
ethyl (2-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazino)acetate

[0148] The desired product was prepared by substituting ethyl hydrazinoacetate for 1-benzylhydrazine dihydrochloride in Example 1.

[0149] MS(APCI) m/e 302 (M+H)+;

[0150] 'H NMR (300 MHz, CD3OD) δ 4.20 (q, 2H), 4.18 (d, 1H), 3.62 (d, 2H), 3.60 (m, 1H), 1.82-1.57 (m, 7H), 1.56-1.20 (m, 4H), 1.28 (t, 3H), 1.05-0.90 (m, 2H).

EXAMPLE 11
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N’-(4-methoxyphenyl)butanohydrazide

[0151] The desired product was prepared by substituting 1-(4-methoxyphenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.
MS(APCI) m/e 322 (M+H)*;

**[0153]** 'H NMR (300 MHz, CD₂OD) δ 6.82 (m, 4H), 4.27 (t, 1H), 3.72 (s, 3H), 3.61 (m, 1H), 1.85-1.62 (m, 6H), 1.55-1.18 (m, 5H), 1.08-0.90 (m, 2H).

**EXAMPLE 12**

**[0154]** (2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-1-naphthyl)butanohydrazide

**[0155]** The desired product was prepared by substituting 1(1-naphthyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

**[0156]** MS(APCI) m/e 342 (M+H)*;

**[0157]** 'H NMR (300 MHz, CD₂OD) δ 8.06 (m, 1H), 7.82 (m, 1H), 7.48 (m, 2H), 7.41-7.29 (m, 2H), 6.91 (dd, 1H), 4.38 (t, 1H), 3.68 (m, 1H), 1.89-1.66 (m, 6H), 1.60-1.47 (m, 2H), 1.19-1.31 (m, 3H), 1.09-0.92 (m, 2H).

**EXAMPLE 13**

benzyl 2-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazinecarboxylate

**EXAMPLE 13A**

benzyl 2-(2RS,3R)-3-((tert-butoxycarbonyl)amino)-4-cyclohexyl-2-hydroxybutanoyl)hydrazinecarboxylate

**[0158]** A solution of Example 1 C (1.10 g, 3.65 mmol) in dichloromethane at 0°C was treated with dicyclohexylcarbodiimide (0.83 g, 4.02 mmol), stirred for 30 minutes, treated with benzyl carbonate (0.69 g, 4.02 mmol), warmed to room temperature, and stirred for 32 hours. The mixture was filtered, and concentrated, and the concentrate was purified by flash column chromatography on silica gel with ethyl acetate in hexanes to provide the desired product.

**EXAMPLE 13B**

benzyl 2-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazinecarboxylate

Example 13A (0.09 g, 0.2 mmol) was treated with 4N HCl in dioxane, stirred for 4 hours, concentrated, and precipitated from diethyl ether to provide the desired product.

**[0159]** MS(APCI) m/e 350 (M+H)*;

**[0160]** 'H NMR (300 MHz, DMSO-d₆) δ 10.23 (m, 1H), 10.06 (m, 1H), 9.32 (m, 1H), 7.85 (m, 2H), 7.38 (m, 5H), 6.51 (m, 1H), 5.18 (s, 1H), 5.10 (s, 1H), 4.07 (m, 1H), 3.69 (m, 1H), 3.49 (m, 1H), 3.23 (m, 1H), 1.63 (m, 5H), 1.47 (m, 3H), 1.19 (m, 2H).

**EXAMPLE 14**

(2RS,3R)-3-amino-N'-(E)-(4-chlorophenyl)methylene) -4-cyclohexyl-2-hydroxybutanohydrazide

**EXAMPLE 14A**

tert-butyl (1R,2S)-1-(cyclohexylmethyl)-3-hydroxy-2-oxopropylcarbamate

**[0161]** A solution of Example 13A (0.37 g, 0.82 mmol) in methanol (15mL) was treated with Pd-carbon (0.05 g), stirred under a hydrogen atmosphere for 16 hours, filtered, and concentrated to provide the desired product.

**EXAMPLE 14B**

(2RS,3R)-3-amino-N'-(E)-(4-chlorophenyl)methylene) -4-cyclohexyl-2-hydroxybutanohydrazide

**[0162]** A solution of Example 14A (0.064 g, 0.20 mmol) in ethanol (3 mL) was treated with pyridine (2 mL) and 4-chlorobenzaldehyde (0.033 mL, 0.23 mmol), heated to 85°C, stirred for 16 hours, and concentrated. The concentrate was purified by flash column chromatography on silica gel with ethyl acetate in hexanes, and the purified concentrate was treated with 4N HCl in dioxane, stirred for 4 hours, concentrated, precipitated from diethyl ether, and collected by filtration to provide the desired product.

**[0163]** MS(APCI) m/e 336 (M–H–);

**[0164]** 'H NMR (300 MHz, DMSO-d₆) δ 11.60 (m, 1H), 8.42 (m, 1H), 7.83 (m, 2H), 7.71 (m, 2H), 7.53 (m, 2H), 6.61 (m, 1H), 4.18 (m, 1H), 4.12 (m, 1H), 3.70 (m, 1H), 1.66 (m, 5H), 1.43 (m, 3H), 1.19 (m, 2H).

**EXAMPLE 15**

ethyl 3-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazino)-3-oxopropanoate

**[0165]** A solution of Example 14A (0.096 g, 0.30 mmol) in dichloromethane (8 mL) at 0°C was treated with N-methylmorpholine (0.094 mL, 0.67 mmol) and ethyl-3-chloro-3-oxo propionate (0.049 mL, 0.38 mmol), stirred for 30 minutes, warmed to room temperature and stirred for 16 hours. The mixture was treated with dichloromethane, washed sequentially with 0.5M HCl water, and brine, dried (MgSO₄), filtered, and concentrated. The concentrate was purified by flash column chromatography on silica gel with ethyl acetate in hexanes, and the purified concentrate was treated with 4N HCl in dioxane, stirred for 4 hours, concentrated, precipitated from diethyl ether, and collected by filtration to provide the desired product.

**[0166]** MS(APCI) m/e 330 (M+H)*;

**[0167]** 'H NMR (300 MHz, DMSO-d₆) δ 10.24 (m, 1H), 7.71 (m, 2H), 6.53 (m, 1H), 4.10 (m, 5H), 3.70 (m, 1H), 3.49 (m, 2H), 3.37 (m, 1H), 1.65 (m, 5H), 1.43 (m, 3H), 1.20 (m, 5H).

**EXAMPLE 16**

benzyl 2-(2RS,3S)-3-amino-4-(cyclohexylmethyl)sulfonyl)-2-hydroxybutanoyl)hydrazinecarboxylate

**EXAMPLE 16A**

(2S)-2-((tert-butoxycarbonyl)amino)-3-(cyclohexylmethyl)sulfonyl)propanoic acid

**[0168]** A solution of D-cysteine hydrochloride (4.78 g, 39.4 mmol) in liquid ammonia (250 mL) at 70°C was slowly treated with sodium (3.78 g, 161 mmol), stirred for 30 minutes, treated with (bromomethyl)cyclohexane (6.33 mL, 45.4 mmol), warmed to room temperature, and stirred until the ammonia evaporated. The residue was treated with water(75 mL), isopropanol (50 mL) and di-tert-butyl dicar-
bonate (9.97 mL, 43.3 mmol), stirred for 24 hours, and concentrated. The concentrate was dissolved in water (150 mL), cooled to 0°C, adjusted to pH 7 with 3N HCl, and extracted with diethyl ether. The combined extracts were washed with brine, dried (MgSO\(_4\)), filtered, and concentrated to provide the desired product.

**EXAMPLE 16B**

(2RS,3R) 3-(tert-butoxycarbonylamino)-2-hydroxy-4-(cyclohexylmethylthio)butanoic acid

**EXAMPLE 17A**

N-(tert-butoxycarbonyl)-S-propyl-D-cysteine

**EXAMPLE 17B**

(2RS,3R) 3-(tert-butoxycarbonylamino)-2-hydroxy-4-(propylthio)butanoic acid

**EXAMPLE 17C**

benzyl 2-((2RS, 3S)-3-amino-4-(propylsulfonyl)butanoyl)hydracinecarboxylate

**EXAMPLE 18**

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(2,2,2-trifluoroethyl)butanohydrazide

**EXAMPLE 19**

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanohydrazide

**EXAMPLE 20**

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N-(3-methyl-N-(3-nitro-2-pyridinyl)butanoyl)hydracinecarboxylate

**EXAMPLE 21**

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N-(2S)-2-(methoxymethyl)pyrrolidinyl)butanamide

**EXAMPLE 22**

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N-(1-pyrrolidinyl)butanamide

**EXAMPLE 180**

\[ {^{1}H \text{NMR (300 MHz, DMSO-d_{6})} \delta 9.30 (m, 1H), 8.12 (m, 2H), 7.38 (m, 1H), 6.63 (m, 1H), 5.10 (m, 2H), 4.28 (m, 1H), 3.70 (m, 2H), 3.49(m, 3H), 2.84 (m, 1H), 2.48 (m, 1H), 1.52 (m, 2H), 0.95 (m, 3H).} \]
[0195] MS(APCI) m/z 270 (M+H)+;

[0196] 1H NMR (300 MHz, CD2OD) δ 4.43 (d, 1H), 3.78-3.63 (m, 5H), 2.19 (m, 4H), 1.84-0.92 (m, 13H).

EXAMPLE 23

(2RS,3R)-3-amino-4-cyclohexyl-N'-(2,4-difluorophenyl)-2-hydroxybutanoylhydrazone

[0197] The desired product was prepared by substituting 1-(2,4-difluorophenyl)hydrazone for 1-benzylhydrazine dihydrochloride in Example 1.

[0198] MS(APCI) m/z 328 (M+H)+;

[0199] 1H NMR (300 MHz, CD2OD) δ 6.98-6.88 (m, 2H), 6.81 (m, 1H), 4.30 (d, 1H), 3.60 (m, 1H), 1.83-1.65 (m, 6H), 1.55-1.41 (m, 2H), 1.38-1.20 (m, 3H), 1.08-0.92 (m, 2H).

EXAMPLE 24

(2RS,3R)-3-amino-N',4-dicyclohexyl-2-hydroxybutanoylhydrazone

[0200] The desired product was prepared by substituting 1-cyclohexylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0201] MS(APCI) m/z 298 (M+H)+;

[0202] 1H NMR (300 MHz, CD2OD) δ 4.42 (d, 1H), 3.79 (m, 1H), 3.67 (m, 1H), 2.14-2.05 (m, 2H), 1.95-1.86 (m, 2H), 1.81-1.68 (m, 6H), 1.55-1.25 (m, 1H), 1.08-0.92 (m, 2H).

EXAMPLE 25

4-(2-((2RS,3R)-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazino)benzenesulfonamide

[0203] The desired product was prepared by substituting 4-hydrazino benzene sulfonamide for 1-benzylhydrazine dihydrochloride in Example 1.

[0204] MS(APCI) m/z 371 (M+H)+;

[0205] 1H NMR (300 MHz, CD2OD) δ 7.72 (d, 2H), 6.90 (d, 2H), 4.34 (d, 1H), 3.67 (m, 1H), 1.88-1.65 (m, 6H), 1.60-1.47 (m, 2H), 1.37-1.21 (m, 3H), 1.02-0.92 (m, 2H).

EXAMPLE 26

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-phenylbutanoylhydrazone

[0206] The desired product was prepared by substituting 1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0207] MS(APCI) m/z 292 (M+H)+;

[0208] 1H NMR (300 MHz, CD2OD) δ 7.19 (m, 2H), 6.83 (m, 3H), 4.29 (d, 1H), 3.61 (m, 1H), 1.84-1.64 (m, 6H), 1.56-1.42 (m, 2H), 1.38-1.17 (m, 3H), 1.18-0.90 (m, 2H).

EXAMPLE 27

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(2-pyridinyl)butanoylhydrazone

[0209] The desired product was prepared by substituting 2-hydrazinopyridine for 1-benzylhydrazine dihydrochloride in Example 1.

[0210] MS(APCI) m/z 293 (M+H)+;

[0211] 1H NMR (300 MHz, CD2OD) δ 8.01 (m, 1H), 7.78 (m, 1H), 6.93 (m, 2H), 4.39 (d, 1H), 3.68 (m, 1H), 1.85-0.98 (m, 13H).

EXAMPLE 28

N'((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-ethoxybenzohydrazide

[0212] The desired product was prepared by substituting 4-ethoxybenzohydrazide for 1-benzylhydrazine dihydrochloride in Example 1.

[0213] MS(APCI) m/z 364 (M+H)+;

[0214] 1H NMR (300 MHz, CD2OD) δ 7.86 (d, 2H), 7.00 (d, 2H), 4.35 (d, 1H), 4.11 (q, 2H), 3.69 (m, 1H), 1.88-1.70 (m, 6H), 1.66-1.52 (m, 2H), 1.41 (t, 3H), 1.37-1.20 (m, 3H), 1.10-0.96 (m, 2H).

EXAMPLE 29

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N-(4-oxo-2-thioxo-1,3-thiazolidin-3-yl)butanamide

[0215] The desired product was prepared by substituting 3-amino-2-thioxo-1,3-thiazolidin-4-one for 1-benzylhydrazine dihydrochloride in Example 1.

[0216] MS(APCI) m/z 332 (M+H)+;

[0217] 1H NMR (300 MHz, CD2OD) δ 4.38 (d, 1H), 4.25 (br s, 1H), 3.74 (m, 1H), 1.86-0.96 (m, 13H).

EXAMPLE 30

(2RS 3R)-3-amino-N'-(6-chloro-3-pyridazinyl)-4-cyclohexyl-2-hydroxy-N'-methylbutanoylhydrazide

[0218] The desired product was prepared by substituting 3-chloro-6-(1-methylhydrazino)pyridazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0219] MS(APCI) m/z 342 (M+H)+;

[0220] 1H NMR (300 MHz, CD2OD) δ 7.57 (d, 1H), 7.33 (d, 1H), 4.40 (d, 1H), 3.64 (m, 1H), 3.40 (s, 3H), 1.86-1.67 (m, 6H), 1.64-1.16 (m, 5H), 1.08-0.92 (m, 2H).

EXAMPLE 31

(2RS,3R)-3-amino-N'-(3-chloro-6-methyl-6-oxo-1,6-dihydro-4-pyridazinyl)-4-cyclohexyl-2-hydroxy-N'-methylbutanoylhydrazide

[0221] The desired product was prepared by substituting 4-chloro-2-methyl-5-(1-methylhydrazino)-3(2H)-pyridazinone for 1-benzylhydrazine dihydrochloride in Example 1.

[0222] MS(APCI) m/z 372 (M+H)+.

EXAMPLE 32

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N-(1-piperidinyl)butanamide

[0223] The desired product was prepared by substituting 1-aminopiperidine for 1-benzylhydrazine dihydrochloride in Example 1.
EXAMPLE 33

N'-[(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl]-5,5-dimethoxybenzohydrazide

[0226] The desired product was prepared by substituting 3,5-dimethoxybenzohydrazide for 1-benzylhydrazine dihydrochloride in Example 1.

EXAMPLE 34

N'-[(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl]-1,3-benzodioxole-5-carboxyhydrazide

[0229] The desired product was prepared by substituting 1,3-benzodioxole-5-carboxyhydrazide for 1-benzylhydrazine dihydrochloride in Example 1.

EXAMPLE 35

(2RS,3R)-3-amino-N'-((4-bromophenyl)-4-cyclohexyl-2-hydroxybutanoyl)hydrazide

[0232] The desired product was prepared by substituting 1-(4-bromophenyl)hydrazine for 1-benzylhydrazine in Example 1.

EXAMPLE 36

(2RS,3R)-3-amino-5-ethylsulfanyl-2-hydroxy-N'-((4-methylphenyl)pentanoyl)hydrazide

[0235] The desired product was prepared by substituting (2R)-2-[[((tert-butoxycarbonyl)amino)-4-(ethylsulfanyl)butanoic acid and 1-(4-methylphenyl)hydrazine for (2R)-2-[[[(tert-butoxycarbonyl)amino]-3-cyclohexylpropanoic acid and 1-benzylhydrazine dihydrochloride, respectively, in Example 1.

EXAMPLE 37

(2RS,3R)-3-amino-5-ethylsulfanyl-2-hydroxy-N'-((4-methoxyphenyl)pentanoyl)hydrazide

[0238] The desired product was prepared by substituting 1-(4-methylphenyl)hydrazine for 1-(4-(methylphenyl)hydrazine in Example 36.

EXAMPLE 38

(2RS,3R)-3-amino-5-ethylsulfanyl-2-hydroxy-N'-((1-naphthyl)pentanoyl)hydrazide

[0241] The desired product was prepared by substituting 1-(1-naphthyl)hydrazine for 1-(4-(methylphenyl)hydrazine in Example 36.

EXAMPLE 39

methyl 2-[[2-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazino]-4-(trifluoromethyl)-5-pyrimidinecarboxylate

[0244] The desired product was prepared by substituting methyl 2-hydrazino-4-(trifluoromethyl)-5-pyrimidinecarboxylate for 1-benzylhydrazine dihydrochloride in Example 1.

EXAMPLE 40

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-((2-methylphenyl)butanoyl)hydrazide

[0246] The desired product was prepared by substituting 1-(2-(methylphenyl)hydrazine dihydrochloride in Example 1.

EXAMPLE 41

(2RS,3R)-3-amino-N'-((2-chlorophenyl)-4-cyclohexyl-2-hydroxybutanoyl)hydrazide

[0249] The desired product was prepared by substituting 1-(2-chlorophenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

EXAMPLE 42

(2RS,3R)-3-amino-N'-((2-methylphenyl)-2-cyclohexyl-2-hydroxybutanoyl)hydrazide

[0250] The desired product was prepared by substituting 1-(2-methylphenyl)hydrazine dihydrochloride in Example 1.
EXAMPLE 42

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N’-(3-(trifluoromethyl)phenyl)butanoylhydrazide

EXAMPLE 43

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N’-(2-hydroxy-3-(3-(trifluoromethyl)phenoxy)propyl)N’-methylbutanoylhydrazide

EXAMPLE 44

methyl 3-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazino)-2-thiophenecarboxylate

EXAMPLE 45

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N’-(2-pyridinylcarbonyl)butanoylhydrazide

EXAMPLE 46

N’-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2-chlorobenzohydrazide

EXAMPLE 47

N’-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-bromobenzohydrazide

EXAMPLE 48

N’-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-methoxybenzohydrazide

EXAMPLE 49

N’-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,5-dichlorobenzohydrazide

EXAMPLE 50

N’-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2-methoxybenzohydrazide
N′-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-chlorobenzoylhydrazide

[0279] The desired product was prepared by substituting 3-chlorobenzoylhydrazide for 1-benzylhydrazine dihydrochloride in Example 1.

[0280] MS(APCI) m/z 354 (M+H)+;

[0281] 1H NMR (300 MHz, CD3OD) δ 7.91 (m, 1H), 7.82 (m, 1H), 7.62 (m, 1H), 7.51 (t, 1H), 4.38 (d, 1H), 3.69 (m, 1H), 1.88-1.68 (m, 6H), 1.62-1.52 (m, 1H), 1.52-1.40 (m, 1H), 1.38-1.20 (m, 3H), 1.10-0.94 (m, 2H).

EXAMPLE 52
N′-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-methylbenzoylhydrazide

[0282] The desired product was prepared by substituting 3-methylbenzoylhydrazide for 1-benzylhydrazine dihydrochloride in Example 1.

[0283] MS(APCI) m/z 334 (M+H)+;

[0284] 1H NMR (300 MHz, CD3OD) δ 7.75-7.66 (m, 2H), 7.48-7.34 (m, 2H), 4.37 (d, 1H), 3.69 (m, 1H), 2.41 (s, 3H), 1.88-1.67 (m, 6H), 1.62-1.50 (m, 1H), 1.50-1.40 (m, 1H), 1.40-1.18 (m, 3H), 1.10-0.94 (m, 2H).

EXAMPLE 53
N′-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,4-dimethoxybenzoylhydrazide

[0285] The desired product was prepared by substituting 2,4-dimethoxybenzoylhydrazide for 1-benzylhydrazine dihydrochloride in Example 1.

[0286] MS(APCI) m/z 352 (M+H)+;

[0287] 1H NMR (300 MHz, CD3OD) δ 7.72 (d, 1H), 6.38 (dt, 2H), 4.37 (d, 1H), 3.67 (m, 1H), 1.87-1.65 (m, 6H), 1.62-1.52 (m, 1H), 1.52-1.49 (m, 1H), 1.39-1.18 (m, 3H), 1.10-0.97 (m, 2H).

EXAMPLE 54
ethyl 3-(2-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazino)-6,6-dimethyl-4-oxo-4,5,6,7-tetrahydro-2-benzothiophene-1-carboxylate

[0288] The desired product was prepared by substituting ethyl 3-hydrazino-6,6-dimethyl-4-oxo-4,5,6,7-tetrahydro-2-benzothiophene-1-carboxylate for 1-benzylhydrazine dihydrochloride in Example 1.

[0289] MS(APCI) m/z 466 (M+H)+;

[0290] 1H NMR (300 MHz, CD3OD) δ 4.38 (d, 1H), 4.28 (q, 2H), 3.67 (m, 1H), 2.54 (d, 2H), 2.39 (s, 2H), 1.90-1.71 (m, 6H), 1.71-1.43 (m, 2H), 1.40-1.16 (m, 6H), 1.08 (s, 3H), 1.06 (s, 3H), 1.10-0.94 (m, 2H).

EXAMPLE 55
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N′-(4-iodophenyl)butanoylhydrazide

[0291] The desired product was prepared by substituting 1-(4-iodophenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0292] MS(APCI) m/z 418 (M+H)+;

[0293] 1H NMR (300 MHz, CD3OD) δ 7.47 (d, 2H), 6.66 (d, 2H), 4.28 (d, 1H), 3.62 (m, 1H), 1.85-1.62 (m, 6H), 1.55-1.42 (m, 2H), 1.37-1.17 (m, 3H), 1.08-0.88 (m, 2H).

EXAMPLE 56
(2RS,3R)-3-amino-N′-(1,3-benzoazol-2-yl)-4-cyclohexyl-2-hydroxybutanoylhydrazide

[0294] The desired product was prepared by substituting 2-hydrazino-1,3-benzoazole for 1-benzylhydrazine dihydrochloride in Example 1.

[0295] MS(APCI) m/z 349 (M+H)+;

[0296] 1H NMR (300 MHz, CD3OD) δ 7.76 (dd, 1H), 7.51 (m, 2H), 7.33 (m, 1H), 3.87 (d, 1H), 3.78 (m, 1H), 1.82-1.60 (m, 6H), 1.48-1.16 (m, 5H), 1.16-0.91 (m, 2H).

EXAMPLE 57
N′-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,5-dimethoxybenzoylhydrazide

[0297] The desired product was prepared by substituting 2,5-dimethoxybenzoylhydrazide for 1-benzylhydrazine dihydrochloride in Example 1.

[0298] MS(APCI) m/z 380 (M+H)+;

[0299] 1H NMR (300 MHz, CD3OD) δ 7.54 (m, 1H), 7.14 (m, 2H), 4.38 (d, 1H), 3.96 (s, 3H), 3.79 (s, 3H), 3.71 (m, 1H), 1.88-1.67 (m, 6H), 1.62-1.50 (m, 1H), 1.50-1.40 (m, 1H), 1.38-1.18 (m, 3H), 1.10-0.93 (m, 2H).

EXAMPLE 58
(2RS,3R)-3-amino-N′-(3-chlorophenyl)-4-cyclohexyl-2-hydroxybutanoylhydrazide

[0300] The desired product was prepared by substituting 1-(3-chlorophenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0301] MS(APCI) m/z 326 (M+H)+;

[0302] 1H NMR (300 MHz, CD3OD) δ 7.15 (t, 1H), 6.84-6.73 (m, 2H), 4.30 (d, 1H), 3.62 (m, 1H), 1.88-1.64 (m, 6H), 1.58-1.42 (m, 2H), 1.37-1.17 (m, 3H), 1.08-0.87 (m, 2H).

EXAMPLE 59
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N′-(3-methoxyphenyl)butanoylhydrazide

[0303] The desired product was prepared by substituting 1-(3-methoxyphenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.
EXAMPLE 60
(2RS,3R)-3-amino-4-cyclohexyl-N’-(3,5-dichlorophenyl)-2-hydroxy butanoxydrazide

[0306] The desired product was prepared by substituting 1-(3,5-dichlorophenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0307] MS(APCI) m/z 361 (M+H)+;

[0308] ¹H NMR (300 MHz, CD₂OD) δ 7.12-7.05 (m, 1H), 6.46-6.39 (m, 2H), 4.27 (d, 1H), 3.73 (s, 3H), 3.61 (m, 1H), 1.84-1.63 (m, 6H), 1.56-1.40 (m, 2H), 1.40-1.25 (m, 3H), 1.08-0.96 (m, 2H).

EXAMPLE 61
(2RS,3R)-3-amino-N’-(3-bromophenyl)-4-cyclohexyl-2-hydroxybutanoxydrazide

[0309] The desired product was prepared by substituting 1-(3-bromophenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0310] MS(APCI) m/z 371 (M+H)+;

[0311] ¹H NMR (300 MHz, CD₂OD) δ 7.09 (t, 1H), 7.00-6.91 (m, 2H), 6.81 (m, 1H), 4.29 (d, 1H), 3.62 (m, 1H), 1.87-1.63 (m, 6H), 1.56-1.43 (m, 2H), 1.37-1.18 (m, 3H), 1.09-0.90 (m, 2H).

EXAMPLE 62
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N’-(trifluoroacetyl)butanoxydrazide

[0312] The desired product was prepared by substituting 2,2,2-trifluoroacetylhydrazide for 1-benzylhydrazine dihydrochloride in Example 1.

[0313] MS(APCI) m/z 312 (M+H)+;

[0314] ¹H NMR (300 MHz, CD₂OD) δ 4.36 (d, 1H), 3.68 (m, 1H), 1.85-1.67 (m, 6H), 1.59-1.18 (m, 5H), 1.08-0.93 (m, 2H).

EXAMPLE 63
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N’-(4-isopropylphenyl)butanoxydrazide

[0315] The desired product was prepared by substituting 1-(4-isopropylphenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0316] MS(APCI) m/z 334 (M+H)+;

[0317] ¹H NMR (300 MHz, CD₂OD) δ 7.12 (d, 2H), 6.78 (d, 2H), 4.29 (d, 1H), 3.61 (m, 1H), 2.83 (m, 1H), 1.82-0.95 (m, 19H).

EXAMPLE 64
(2RS,3R)-3-amino-N’-(3-chloro-4-methylphenyl)-4-cyclohexyl-2-hydroxybutanoxydrazide

[0318] The desired product was prepared by substituting 1-(3-chloro-4-methylphenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0319] MS(APCI) m/z 340 (M+H)+;

[0320] ¹H NMR (300 MHz, CD₂OD) δ 7.91 (d, 1H), 7.85 (s, 1H), 6.73 (d, 1H), 4.28 (d, 1H), 3.62 (m, 1H), 2.25 (s, 3H), 1.83-1.00 (m, 13H).

EXAMPLE 65
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N’-(4-(trifluoromethoxy)phenyl)butanoxydrazide

[0321] The desired product was prepared by substituting 1-(4-(trifluoromethoxy)phenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0322] MS(APCI) m/z 376 (M+H)+;

[0323] ¹H NMR (300 MHz, CD₂OD) δ 7.11 (d, 2H), 6.93 (m, 2H), 4.28 (d, 1H), 3.62 (m, 1H), 1.80-1.02 (m, 13H).

EXAMPLE 66
(2RS,3R)-3-amino-4-cyclohexyl-N’-(4-fluorophenyl)-2-hydroxybutanoxydrazide

[0324] The desired product was prepared by substituting 1-(4-fluorophenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0325] MS(APCI) m/z 310 (M+H)+;

[0326] ¹H NMR (300 MHz, CD₂OD) δ 6.94 (m, 4H), 4.31 (d, 1H), 3.58 (m, 1H), 1.83-0.97 (m, 13H).

EXAMPLE 67
(2RS,3R)-3-amino-N’-(4-chlorophenyl)-4-cyclohexyl-2-hydroxybutanoxydrazide

[0327] The desired product was prepared by substituting 1-(4-chlorophenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0328] MS(APCI) m/z 326 (M+H)+;

[0329] ¹H NMR (300 MHz, CD₂OD) δ 7.20 (d, 2H), 6.83 (d, 2H), 4.29 (d, 1H), 3.61 (m, 1H), 1.80-1.00 (m, 13H).

EXAMPLE 68
(2RS,3R)-3-amino-4-cyclohexyl-N’-(2-ethylphenyl)-2-hydroxybutanoxydrazide

[0330] The desired product was prepared by substituting 1-(2-ethylphenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0331] MS(APCI) m/z 320 (M+H)+;

[0332] ¹H NMR (300 MHz, CD₂OD) δ 7.10 (m, 2H), 6.82 (m, 2H), 4.31 (d, 1H), 3.58 (m, 1H), 2.61 (q, 2H), 1.80-1.00 (m, 16H).

EXAMPLE 69
(2RS,3R)-3-amino-4-cyclohexyl-N’-(3-fluorophenyl)-2-hydroxybutanoxydrazide

[0333] The desired product was prepared by substituting 1-(3-fluorophenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0334] MS(APCI) m/z 310 (M+H)+;
[0335] 1H NMR (300 MHz, CD3OD) δ 7.17 (m, 1H), 6.62 (m, 3H), 4.30 (d, 1H), 3.61 (m, 1H), 2.63 (q, 2H), 1.80-1.00 (m, 13H).

EXAMPLE 70
N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-chloro-1-benzothiophene-2-carboxyhydrazone

[0336] The desired product was prepared by substituting 3-chloro-1-benzothiophene-2-carboxyhydrazone for 1-benzylhydrazine dihydrochloride in Example 1.

[0337] MS(APCI) m/z 410 (M+H)+;

[0338] 1H NMR (300 MHz, CD3OD) δ 8.01 (d, 2H), 7.60 (d, 2H), 4.38 (d, 1H), 3.71 (m, 1H), 1.80-1.00 (m, 13H).

EXAMPLE 71
N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-methylbenzohydrazone

[0339] The desired product was prepared by substituting 4-methylbenzohydrazone for 1-benzylhydrazine dihydrochloride in Example 1.

[0340] MS(APCI) m/z 334 (M+H)+;

[0341] 1H NMR (300 MHz, CD3OD) δ 7.80 (d, 2H), 7.32 (d, 2H), 4.39 (d, 1H), 3.70 (m, 1H), 1.80-1.00 (m, 13H).

EXAMPLE 72
N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-nitrobenzohydrazone

[0342] The desired product was prepared by substituting 4-nitrobenzohydrazone for 1-benzylhydrazine dihydrochloride in Example 1.

[0343] MS(APCI) m/z 365 (M+H)+;

[0344] 1H NMR (300 MHz, CD3OD) δ 8.42 (d, 2H), 8.08 (d, 2H), 4.42 (d, 1H), 3.73 (m, 1H), 1.80-1.00 (m, 13H).

EXAMPLE 73
N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2-naphthohydrazone

[0345] The desired product was prepared by substituting 2-naphthohydrazone for 1-benzylhydrazine dihydrochloride in Example 1.

[0346] MS(APCI) m/z 370 (M+H)+;

[0347] 1H NMR (300 MHz, CD3OD) δ 8.53 (s, 1H), 8.01 (m, 5H), 7.59 (m, 2H), 4.38 (d, 1H), 3.72 (m, 1H), 1.80-1.00 (m, 13H).

EXAMPLE 74
(2RS,3R)-3-amino-N’-(4-chloro-2-methylphenyl)-4-cyclohexyl-2-hydroxybutanoylhydrazone

[0348] The desired product was prepared by substituting 1-(4-chloro-2-methylphenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0349] MS(APCI) m/z 340 (M+H)+;

[0350] 1H NMR (300 MHz, CD3OD) δ 7.08-7.01 (m, 2H), 6.77 (d, 1H), 4.33 (d, 1H), 3.66 (m, 1H), 2.23 (s, 3H), 1.86-1.64 (m, 6H), 1.57-1.44 (m, 2H), 1.37-1.22 (m, 3H), 1.08-0.92 (m, 2H).

EXAMPLE 75
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N’-mesitylbutanoylhydrazone

[0351] The desired product was prepared by substituting 1-mesitylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0352] MS(APCI) m/z 334 (M+H)+;

[0353] 1H NMR (300 MHz, CD3OD) δ 6.77 (bs, 1H), 6.74 (bs, 1H), 4.14 (d, 1H), 3.52 (m, 1H), 2.32 (d, 6H), 2.18 (d, 3H), 1.78-1.61 (m, 6H), 1.48-1.14 (m, 5H), 1.02-0.75 (m, 2H).

EXAMPLE 76
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N’-(4-((1E)-2-(4-pyridinyl)ethenyl)phenyl)butanoylhydrazone

[0354] The desired product was prepared by substituting 2-((1E)-3-(4-hydroxyphenyl)propenyl)pyridine for 1-benzylhydrazine dihydrochloride in Example 1.

[0355] MS(APCI) m/z 395 (M+H)+.

EXAMPLE 77
(2RS,3R)-3-amino-4-cyclohexyl-N’-(2-fluorophenyl)-2-hydroxybutanoylhydrazone

[0356] The desired product was prepared by substituting 1-(2-fluorophenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0357] MS(APCI) m/z 310 (M+H)+;

[0358] 1H NMR (300 MHz, CD3OD) δ 7.04 (dt, 1H), 7.00 (dd, 1H), 6.94 (dt, 1H), 6.82 (m, 1H), 4.31 (d, 1H), 3.64 (m, 1H), 1.86-1.64 (m, 6H), 1.57-1.42 (m, 2H), 1.42-1.17 (m, 3H), 1.08-0.92 (m, 2H).

EXAMPLE 78
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N’-(2-quinoxalinyl)butanoylhydrazone

[0359] The desired product was prepared by substituting 2-hydroxyquinoxalinyl for 1-benzylhydrazine dihydrochloride in Example 1.

[0360] MS(APCI) m/z 344 (M+H)+;

[0361] 1H NMR (300 MHz, CD3OD) δ 8.71 (s, 1H), 8.03 (d, 1H), 7.93 (d, 1H), 7.78 (t, 1H), 7.66 (t, 1H), 4.55 (d, 1H), 3.77 (m, 1H), 1.87-1.65 (m, 6H), 1.65-1.44 (m, 2H), 1.44-1.16 (m, 3H), 1.10-0.94 (m, 2H).

EXAMPLE 79
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N’-(4-(trifluoromethyl)phenyl)butanoylhydrazone

[0362] The desired product was prepared by substituting 1-(4-(trifluoromethyl)phenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.
EXAMPLE 80

(2RS,3R)-3-amino-N'-(2-chloro-6-fluorophenyl)-4-cyclohexyl-2-hydroxybutanoylhydrazide

[0365] The desired product was prepared by substituting 1-(2-chloro-6-fluorophenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0366] MS(APCI) m/e 344 (M+H)+;

[0367] 1H NMR (300 MHz, CD3OD) δ 7.16 (dt, 1H), 7.07-6.99 (m, 1H), 6.92 (dt, 1H), 4.20 (d, 1H), 3.55 (m, 1H), 1.80-1.66 (m, 6H), 1.50-1.35 (m, 2H), 1.35-1.18 (m, 3H), 1.03-0.87 (m, 2H).

EXAMPLE 81

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N,N-dimethyl-5-(trifluoromethyl)-2-pyridinylbutanoylhydrazide

[0368] The desired product was prepared by substituting 2-(1-methylhydrizinio)-5-(trifluoromethyl)pyridine for 1-benzylhydrazine dihydrochloride in Example 1.

[0369] MS(APCI) m/e 375 (M+H)+;

[0370] 1H NMR (300 MHz, CD3OD) δ 8.42 (bs, 1H), 8.11 (dd, 1H), 7.25 (d, 1H), 4.50 (d, 1H), 3.72 (m, 1H), 3.48 (s, 3H), 1.87-1.66 (m, 6H), 1.62-1.52 (m, 1H), 1.52-1.45 (m, 1H), 1.38-1.21 (m, 3H), 1.08-0.93 (m, 2H).

EXAMPLE 82

(2RS,3R)-3-amino-4-cyclohexyl-N(2,5-difluoropyridinyl)-2-hydroxybutanoylhydrazide

[0371] The desired product was prepared by substituting 1-(2,5-difluorophenyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0372] MS(APCI) m/e 328 (M+H)+;

[0373] 1H NMR (300 MHz, CD3OD) δ 7.01 (m, 1H), 6.67 (m, 1H), 6.50 (m, 1H), 4.33 (d, 1H), 3.65 (m, 1H), 1.86-1.65 (m, 6H), 1.58-1.44 (m, 2H), 1.38-1.18 (m, 3H), 1.06-0.92 (m, 2H).

EXAMPLE 83

(2RS,3R)-3-amino-4-cyclohexyl-N-(1,3-dimethyl-4-nitro-1H-pyrazol-5-yl)-2-hydroxybutanoylhydrazide

[0374] The desired product was prepared by substituting 5-hydrazino-1,3-dimethyl-4-nitro-1H-pyrazole for 1-benzylhydrazine dihydrochloride in Example 1.

[0375] MS(APCI) m/e 355 (M+H)+;

[0376] 1H NMR (300 MHz, CD3OD) δ 4.39 (d, 1H), 3.74 (s, 3H), 3.67 (m, 1H), 2.40 (s, 3H), 1.83-1.64 (m, 6H), 1.55-1.17 (m, 5H), 1.08-0.90 (m, 2H).

EXAMPLE 84

2-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-N-phenylhydrazinedicarboxamide

[0377] The desired product was prepared by substituting N-phenylhydrazinedicarboxamide for 1-benzylhydrazine dihydrochloride in Example 1.

[0378] MS(APCI) m/e 335 (M+H)+;

[0379] 1H NMR (300 MHz, CD3OD) δ 7.41 (d, 2H), 7.28 (t, 2H), 7.03 (t, 1H), 4.33 (d, 1H), 3.68 (m, 1H), 1.87-1.67 (m, 6H), 1.60-1.50 (m, 1H), 1.50-1.38 (m, 1H), 1.37-1.18 (m, 3H), 1.08-0.97 (m, 2H).

EXAMPLE 85

2-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-N-(4-chloro-2-methoxyphenyl)hydrazinedicarboxamide

[0380] The desired product was prepared by substituting N-(4-chloro-2-methoxyphenyl)hydrazinedicarboxamide for 1-benzylhydrazine dihydrochloride in Example 1.

[0381] MS(APCI) m/e 399 (M+H)+;

[0382] 1H NMR (300 MHz, CD3OD) δ 8.10 (d, 1H), 6.96 (d, 2H), 4.34 (d, 1H), 3.90 (s, 3H), 3.68 (m, 1H), 1.86-1.66 (m, 6H), 1.62-1.50 (m, 1H), 1.50-1.38 (m, 1H), 1.38-1.17 (m, 3H), 1.11-0.93 (m, 2H).

EXAMPLE 86

2-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-N-(3-fluorophenyl)hydrazinedicarboxamide

[0383] The desired product was prepared by substituting N-(3-fluorophenyl)hydrazinedicarboxamide for 1-benzylhydrazine dihydrochloride in Example 1.

[0384] MS(APCI) m/e 353 (M+H)+;

[0385] 1H NMR (300 MHz, CD3OD) δ 7.41 (d, 1H), 7.26 (q, 1H), 7.09 (d, 1H), 6.75 (t, 1H), 4.34 (d, 1H), 3.68 (m, 1H), 1.87-1.66 (m, 6H), 1.62-1.50 (m, 1H), 1.50-1.48 (m, 1H), 1.48-1.18 (m, 3H), 1.00-0.93 (m, 2H).

EXAMPLE 87

N-((1R)-1-(2-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazinocarbonyl)-3-(methylsulfanyl)propyl-4-(trifluoromethyl)benzamide

[0386] The desired product was prepared by substituting N-((1R)-1-(hydrazinocarbonyl)-3-(methylsulfanyl)propyl)-4-(trifluoromethyl)benzamide for 1-benzylhydrazine dihydrochloride in Example 1.

[0387] MS(APCI) m/e 519 (M+H)+;

[0388] 1H NMR (300 MHz, CD3OD) δ 8.05 (d, 2H), 7.79 (d, 2H), 4.31 (d, 1H), 3.81 (q, 1H), 3.65 (m, 1H), 2.68 (m, 2H), 2.30-2.15 (m, 2H), 2.12 (s, 3H), 1.84-1.63 (m, 6H), 1.58-1.48 (m, 1H), 1.48-1.36 (m, 1H), 1.36-1.20 (m, 3H), 1.06-0.95 (m, 2H).

EXAMPLE 88

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N-(2-thiophenecarbonyl)butanoylhydrazide

[0389] The desired product was prepared by substituting 2-thiophencarbonylbutanoylhydrazide for 1-benzylhydrazine dihydrochloride in Example 1.
[0390] MS(APCI) m/e 326 (M+H)

[0391] 1H NMR (300 MHz, CD3OD) δ 7.81 (dd, 2H), 7.18 (d, 1H), 4.42 (d, 1H), 3.73 (m, 1H), 1.80-1.00 (m, 13H).

EXAMPLE 89

N′-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-chlorobenzohydrazide

[0392] The desired product was prepared by substituting 4-chlorobenzohydrazide for 1-benzylhydrazine dihydrochloride in Example 1.

[0393] MS(APCI) m/e 354 (M+H)

[0394] 1H NMR (300 MHz, CD3OD) δ 7.91 (d, 2H), 7.55 (d, 2H), 4.43 (d, 1H), 3.68 (m, 1H), 1.80-1.00 (m, 13H).

EXAMPLE 90

(2RS,3R)-3-amino-N′-benzovl-4-cyclohexyl-2-hydroxybutanoylhydrazide

[0395] The desired product was prepared by substituting benzohydrazide for 1-benzylhydrazine dihydrochloride in Example 1.

[0396] MS(APCI) m/e 320 (M+H)

[0397] 1H NMR (300 MHz, CD3OD) δ 7.91 (d, 2H), 7.58 (m, 3H), 4.42 (d, 1H), 3.68 (m, 1H), 1.80-1.00 (m, 13H).

EXAMPLE 91

N′-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-bromobenzohydrazide

[0398] The desired product was prepared by substituting 3-bromobenzohydrazide for 1-benzylhydrazine dihydrochloride in Example 1.

[0399] MS(APCI) m/e 400 (M+H)

[0400] 1H NMR (300 MHz, CD3OD) δ 7.81 (d, 2H), 7.72 (d, 2H), 4.37 (d, 1H), 3.69 (m, 1H), 1.80-1.00 (m, 13H).

EXAMPLE 92

N′-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-tert-butylbenzohydrazide

[0401] The desired product was prepared by substituting for 1-benzylhydrazine dihydrochloride in Example 1.

[0402] MS(APCI) m/e 376 (M+H)

[0403] 1H NMR (300 MHz, CD3OD) δ 7.83 (d, 2H), 7.55 (d, 2H), 4.41 (d, 1H), 3.73 (m, 1H), 1.80-1.00 (m, 22H).

EXAMPLE 93

4-chlorobenzyl 2-(2-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazino)-4-(trifluoromethyl)-5-pyrimidinecarboxylate

[0404] The desired product was prepared by substituting 4-chlorobenzyl 2-hydrazone-4-(trifluoromethyl)-5-pyrimidinecarboxylate for 1-benzylhydrazine dihydrochloride in Example 1.

[0405] MS(APCI) m/e 530 (M+H)

[0406] 1H NMR (300 MHz, CD3OD) δ 8.96 (bs, 1H), 7.41 (m, 4H), 4.34 (d, 1H), 3.62 (m, 1H), 1.85-1.67 (m, 6H), 1.62-1.40 (m, 2H), 1.40-1.17 (m, 3H), 1.08-0.93 (m, 2H).

EXAMPLE 94

(2RS,3R)-3-amino-N′-(3-chloro-4-fluorophenyl)-4-cyclohexyl-2-hydroxybutanoylhydrazide

[0407] The desired product was prepared by substituting 3-chloro-4-fluorophenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0408] MS(APCI) m/e 344 (M+H)

[0409] 1H NMR (300 MHz, CD3OD) δ 7.06 (t, 1H), 6.91 (q, 1H), 6.78 (m, 1H), 4.31 (d, 1H), 3.62 (m, 1H), 1.88-1.63 (m, 6H), 1.57-1.41 (m, 2H), 1.41-1.12 (m, 2H), 1.12-0.90 (m, 2H).

EXAMPLE 95

(2RS,3R)-3-amino-N′-(6-chloro-3-pyridazinyl)-4-cyclohexyl-2-hydroxybutanoylhydrazide

[0410] The desired product was prepared by substituting 3-chloro-6-hydrazino-pyridazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0411] MS(APCI) m/e 328 (M+H)

[0412] 1H NMR (300 MHz, CD3OD) δ 7.55 (d, 1H), 7.17 (d, 1H), 4.38 (d, 1H), 3.64 (m, 1H), 1.87-1.68 (m, 6H), 1.56-1.49 (m, 1H), 1.49-1.37 (m, 1H), 1.37-1.17 (m, 3H), 1.07-0.95 (m, 2H).

EXAMPLE 96

(2RS,3R)-3-amino-N′-(2-chlorobenzyl)-4-cyclohexyl-2-hydroxybutanoylhydrazide

[0413] The desired product was prepared by substituting 1-(2-chlorobenzyl)hydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0414] MS(APCI) m/e 340 (M+H)

[0415] 1H NMR (300 MHz, CD3OD) δ 7.54 (m, 1H), 7.49 (m, 1H), 7.28 (m, 2H), 4.13 (q, 2H), 4.11 (d, 1H), 3.52 (m, 1H), 1.80-1.66 (m, 6H), 1.60-1.50 (m, 1H), 1.45-1.16 (m, 4H), 1.00-0.96 (m, 2H).

EXAMPLE 97

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N-((2R)-2-(methoxymethyl)pyrrolidinyl)butanamide

[0416] The desired product was prepared by substituting (2R)-2-(methoxymethyl)-1-pyrrolidinamine for 1-benzylhydrazine dihydrochloride in Example 1.

[0417] MS(APCI) m/e 314 (M+H)

[0418] 1H NMR (300 MHz, CD3OD) δ 4.11 (d, 1H), 3.58 (m, 1H), 3.45 (q, 1H), 3.35 (t, 1H), 3.32 (s, 3H), 3.21 (m, 1H), 3.07 (m, 1H), 2.80 (q, 2H), 2.08-1.93 (m, 1H), 1.88-1.68 (m, 6H), 1.67-1.53 (m, 1H), 1.53-1.48 (m, 2H), 1.48-1.18 (m, 3H), 1.04-0.98 (m, 2H).
EXAMPLE 98

(2RS,3R)-3-amino-5-ethylsulfanyl-2-hydroxy-N-phenoxypentamide

EXAMPLE 98A

3-amino-3,4-dioxygeno-5-S-ethyl-5-thio-D-glycero-pentonic acid

[0419] The desired product was prepared by substituting (2R)-2-((tert-butoxy)carbonylamino)-(4-ethylsulfanyl)butanoic acid for (2R)-2-((tert-butoxy)carbonylamino)-3-cyclohexylpropanoic acid in Examples 1A-C.

EXAMPLE 98B

(2RS,3R)-3-amino-5-ethylsulfanyl-2-hydroxy-N-phenoxypentamide

[0420] A solution of Example 98A (0.39 g, 1.3 mmol), O-phenyl hydroxylamine hydrochloride (0.27 g, 1.9 mmol), 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide hydrochloride (0.29 g, 1.5 mmol), 1-hydroxynicotinamide hydrate (0.20 g, 1.5 mmol), and N-methylmorpholine (0.40 mL, 3.6 mmol) in 3:1 dichloromethane/DMF (8 mL) at room temperature was stirred for 16 hours, diluted with dichloromethane, washed sequentially with aqueous NaHCO₃, brine, 10% KHSO₄, and brine, dried (MgSO₄), filtered, and concentrated. The concentrate was purified by flash column chromatography on silica gel with 95:5 dichloromethane:methanol, and the purified concentrate was dissolved in saturated HCl/dioxane (2 mL), stirred for 1 hour, concentrated, treated with diethyl ether, then concentrated to provide the desired product.

[0421] MS(ESI) m/z 285 (M+H)⁺;

[0422] ¹H NMR (300 MHz, DMSO-d₆) δ 12.31 (bs, 1H), 8.08 (bs, 0.4H), 7.94 (bs, 0.6H), 7.34 (m, 2H), 7.03 (m, 3H), 6.73 (d, 0.6H), 6.62 (d, 0.4H), 4.41 (m, 0.4H), 4.28 (t, 0.6H), 3.48 (m, 1H), 2.73-2.60 (m, 2H), 2.56 (q, 2H), 1.98-1.78 (m, 2H), 1.21 (t, 3H).

EXAMPLE 99

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N-phenoxypentanamide

[0423] The desired product was prepared by substituting Example 1C for Example 98A in Example 98B.

[0424] MS(ESI) m/z 293 (M+H)⁺;

[0425] ¹H NMR (300 MHz, DMSO-d₆) δ 7.92 (bs, 1H), 7.34 (m, 2H), 7.06 (m, 3H), 6.73 (d, 0.4H), 6.70 (d, 0.6H), 4.21 (m, 1H), 3.36 (m, 1H), 1.74-1.60 (m, 6H), 1.50-1.40 (m, 1H), 1.33-1.15 (m, 4H), 0.96-0.80 (m, 2H).

EXAMPLE 100

(2RS,3R)-3-amino-N-(benzoyl)oxy-4-cyclohexyl-2-hydroxybutanamide

[0426] A solution of Example 1C (0.20 g, 0.66 mmol), O-benzyl hydroxylamine hydrochloride (0.22 g, 1.4 mmol), 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide hydrochloride (0.17 g, 0.89 mmol), 1-hydroxynicotinamide (0.14 g, 1.0 mmol), and N-methylmorpholine (0.40 mL, 3.6 mmol) in 5:1 dichloromethane/DMF (6 mL) at room temperature was stirred for 16 hours, diluted with dichloromethane, washed sequentially with aqueous NaHCO₃, brine, 10% KHSO₄, and brine, dried (MgSO₄), filtered, and concentrated. The concentrate was purified by flash column chromatography on silica gel with 98:2 dichloromethane:methanol, and the purified concentrate was dissolved in saturated HCl/dioxane (8 mL), stirred for 1 hour, concentrated, treated with diethyl ether, then concentrated to provide the desired product.

[0427] MS(ESI) m/z 307 (M+H)⁺;

[0428] ¹H NMR (300 MHz, DMSO-d₆) δ 7.78 (br s, 1H), 7.40 (m, 5H), 6.42 (d, 1H), 4.84 (s, 2H), 3.95 (m, 1H), 1.74-1.60 (m, 6H), 1.50-1.40 (m, 1H), 1.33-1.15 (m, 4H), 0.96-0.80 (m, 2H).

EXAMPLE 101

(2RS,3R)-3-amino-N-(methoxy)-4-cyclohexyl-2-hydroxybutanamide

[0429] The desired product was prepared by substituting 0-methylhydroxylamine hydrochloride for O-benzyl hydroxylamine hydrochloride in Example 100.

[0430] MS(APCI) m/z 231 (M+H)⁺;

[0431] ¹H NMR (300 MHz, DMSO-d₆) δ 7.74 (br s, 1H), 6.42 (d, 1H) 3.95 (m, 1H), 3.63 (s, 3H), 1.74-1.60 (m, 6H), 1.50-1.40 (m, 1H), 1.33-1.15 (m, 4H), 0.96-0.80 (m, 2H).

EXAMPLE 102

(2RS,3R)-3-amino-N-(tert-butoxy)-4-cyclohexyl-2-hydroxybutanamide

[0432] The desired product was prepared by substituting 0-tert-butylhydroxylamine hydrochloride for O-benzyl hydroxylamine hydrochloride in Example 100.

[0433] MS(APCI) m/z 273 (M+H)⁺;

[0434] ¹H NMR (300 MHz, DMSO-d₆) δ 7.74 (br s, 1H), 6.44 (d, 1H) 3.92 (m, 1H), 3.74-1.60 (m, 6H), 1.50-1.40 (m, 1H), 1.33-1.15 (m, 4H), 1.19 (s, 9H), 0.96-0.80 (m, 2H).

EXAMPLE 103

(2RS,3R)-3-amino-N-cyclohexyl-2-hydroxybutanamide

[0435] The desired product was prepared by substituting O-ethyl hydroxylamine hydrochloride for O-benzyl hydroxylamine hydrochloride in Example 100.

[0436] MS(APCI) m/z 245 (M+H)⁺;

[0437] ¹H NMR (300 MHz, DMSO-d₆) δ 7.73 (br s, 1H), 6.41 (d, 1H) 3.92 (m, 1H), 3.84 (q, 2H), 1.74-1.60 (m, 6H), 1.50-1.40 (m, 1H), 1.33-1.15 (m, 4H), 1.14 (t, 3H), 0.96-0.80 (m, 2H).

EXAMPLE 104

(2RS,3R)-N-(allyloxy)-3-amino-4-cyclohexyl-2-hydroxybutanamide

[0438] The desired product was prepared by substituting O-allyl hydroxylamine hydrochloride for O-benzyl hydroxylamine hydrochloride in Example 100.

[0439] MS(APCI) m/z 257 (M+H)⁺;

[0440] ¹H NMR (300 MHz, DMSO-d₆) δ 7.74 (br s, 1H), 6.43 (d, 1H), 5.95 (m, 1H), 5.32 (dd, 1H), 5.27 (m, 1H), 4.32
(d, 2H), 3.92 (m, 1H), 1.74-1.60 (m, 6H), 1.50-1.40 (m, 1H), 1.33-1.15 (m, 4H), 0.96-0.80 (m, 2H).

EXAMPLE 105
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N-iso butoxybutanamide

[0441] The desired product was prepared by substituting O-isobutyl hydroxylamine hydrochloride for O-benzyl hydroxylamine hydrochloride in Example 100.

[0442] MS(APCI) m/e 273 (M+H)+

[0443] 1H NMR (300 MHz, DMSO-d6) δ 7.73 (br s, 1H), 6.39 (d, 1H), 3.92 (m, 1H), 3.58 (d, 2H), 1.88 (sept, 1H), 1.74-1.60 (m, 6H), 1.50-1.14 (m, 1H), 1.33-1.15 (m, 4H), 0.91 (d, 6H), 0.90-0.75 (m, 2H).

EXAMPLE 106
(2RS,3R)-3-amino-4-cyclohexyl-N,2-
dihydroxybutanamide

EXAMPLE 106A
(2RS,3R)-3-(fert-butoxycarbonyl)amino-N-(benzyloxy)-4-cyclohexyl-2-hydroxybutanamide

[0444] A solution of Example 1C (0.20 g, 0.66 mmol), O-benzyl hydroxylamine hydrochloride (0.22 g, 1.4 mmol), 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide hydrochloride (0.17 g, 0.89 mmol), 1-hydroxybenzotriazole (0.14 g, 1.0 mmol), and N-methylmorpholine (0.40 mL, 3.6 mmol) in 5:1 dichloromethane/DMF (6 mL) at room temperature was stirred for 16 hours, diluted with dichloromethane, washed sequentially with aqueous NaHCO3, brine, 10% KHSO4, and brine, dried (MgSO4), filtered, and concentrated. The concentrate was purified by flash column chromatography on silica gel with 98:2:dichloromethane/methanol to provide the desired product.

[0445] MS(APCI) m/e 407 (M+H)+

EXAMPLE 106B
(2RS,3R)-3-amino-4-cyclohexyl-N,2-
dihydroxybutanamide

[0446] A solution of Example 106A (0.33 g, 0.82 mmol), and 10% palladium on charcoal (0.13 g) in THF (8 mL) at room temperature was stirred for 16 hours under an atmosphere of hydrogen gas, filtered, and concentrated. The concentrate was dissolved in saturated HCl/dioxane (5 mL), stirred for 1 hour, concentrated, treated with diethyl ether, then concentrated to provide the desired product.

[0447] MS(APCI) m/e 217 (M+H)+

[0448] 1H NMR (300 MHz, DMSO-d6) δ 10.89 (br s, 1H), 8.89 (br s, 1H), 7.80 (br s, 2H), 6.31 (d, 1H), 3.92 (m, 1H), 1.74-1.60 (m, 6H), 1.50-1.40 (m, 1H), 1.33-1.15 (m, 4H), 0.90-0.75 (m, 2H).

EXAMPLE 107
(2RS,3S)-3-amino-4-(ethylsulfanyl)-2-hydroxy-N-phenoxybutanamide

[0449] The desired product was prepared by substituting O-phenylhydroxylamine for 4-methylphenylhydrazine in Example 193.

[0450] MS(ESI) m/e 271 (M+H)+

[0451] 1H NMR (500 MHz, CD3OD) δ 7.32 (t, 2H), 7.10 (d, 2H), 7.06 (m, 1H), 4.56 (d, 0.65H), 4.54 (d, 0.35H), 3.66 (m, 1H), 2.95 (dd, 1H), 2.78 (dd, 1H), 2.64 (dd, 1H), 2.59 (dd, 0.7H), 1.29 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 108
(2RS,3R)-3-amino-3-cyclohexyl-2-hydroxy-N-
phenoxypropanamide

[0452] The desired product was prepared by substituting O-phenylhydroxylamine for 4-methylphenylhydrazine and Example 122A for Example 97A in Example 193.

[0453] MS(ESI) m/e 279 (M+H)+

[0454] 1H NMR (500 MHz, CD3OD) δ 7.33 (t, 2H), 7.08 (m, 3H), 4.51 (d, 0.65H), 4.48 (d, 0.35H), 3.37 (dd, 1H), 1.87-1.72 (m, 6H), 1.35-1.11 (m, 5H).

EXAMPLE 109
(2RS,3S)-3-amino-2-hydroxy-N-phenoxy-4-(
propylsulfanyl)butanamide

[0455] The desired product was prepared by substituting O-phenylhydroxylamine for 4-methylphenylhydrazine and Example 195B for Example 97A in Example 193.

[0456] MS(ESI) m/e 285 (M+H)+

[0457] 1H NMR (500 MHz, CD3OD) δ 7.33 (t, 2H), 7.08 (m, 3H), 4.58 (d, 0.65H), 4.56 (d, 0.35H), 3.68 (m, 1H), 2.94 (dd, 0.65H), 2.87 (dd, 0.35H), 2.78 (m, 1H), 2.60 (dd, 1H), 2.54 (m, 1H), 1.65 (dd, 1H), 1.60 (dd, 1H), 1.02 (t, 1.95H), 0.99 (t, 1.05H).

EXAMPLE 110
(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)-N-
phenoxypentanamide

[0458] The desired product was prepared by substituting O-phenylhydroxylamine for 4-methylphenylhydrazine and Example 124B for Example 97A in Example 193.

[0459] MS(ESI) m/e 299 (M+H)+

[0460] 1H NMR (500 MHz, CD3OD) δ 7.33 (dd, 2H), 7.08 (m, 3H), 4.48 (d, 0.35H), 4.31 (d, 0.65H), 3.75 (m, 2H), 2.97 (dd, 0.65H), 2.93 (dd, 0.35H), 2.71 (m, 1.65H), 2.67 (m, 0.35H), 2.10 (dd, 0.65H), 1.99 (dd, 0.35H), 1.92 (dd, 1H), 1.28 (d, 3H), 1.27 (d, 3H).

EXAMPLE 111
(2RS,3S)-3-amino-2-hydroxy-4-(isobutylsulfanyl)-N-
phenoxybutanamide

[0461] The desired product was prepared by substituting O-phenylhydroxylamine for 4-methylphenylhydrazine and Example 124B for Example 97A in Example 193.

[0462] MS(ESI) m/e 299 (M+H)+

[0463] 1H NMR (500 MHz, CD3OD) δ 7.33 (t, 2H), 7.08 (m, 3H), 4.60 (d, 1H), 3.69 (ddd, 1H), 2.93 (dd, 1H), 2.78 (dd, 1H), 2.50 (m, 2H), 1.83 (ddd, 1H), 1.03 (d, 6H).

EXAMPLE 112
(2RS,3R)-3-amino-5-phenyl-2-hydroxy-N-
phenoxypentanamide

[0464] The desired product was prepared by substituting O-phenylhydroxylamine for 4-methylphenylhydrazine and Example 125A for Example 97A in Example 193.
EXAMPLE 117

```latex
\text{benzyl ([(2RS,3R)-3-aminoo-4-cyclohexyl-2-hydroxybutanoylamino]oxy)acetate}
```

EXAMPLE 117A

```latex
\text{benzyl ([(2RS,3R)-3-(tert-butoxycarbonyl)amino-4-cyclohexyl-2-hydroxybutanoylamino]oxy)acetate}
```

[0479] The desired product was prepared by substituting O-(carboxybenzyl)oxy)methyl hydroxylamine for O-(carboxybetoxy)methyl hydroxylamine hydrochloride in Example 100A.

[0480] MS(APCI) m/e 465 (M+H)+.

EXAMPLE 117B

```latex
\text{benzyl ([(2RS,3R)-3-aminoo-4-cyclohexyl-2-hydroxybutanoylamino]oxy)acetate}
```

[0481] Example 117A was dissolved in saturated HCl/dioxane (3 mL), stirred for 1 hour, concentrated, treated with diethyl ether, then concentrated to provide the desired product.

[0482] MS(APCI) m/e 365 (M+H)+.

[0483] 1H NMR (300 MHz, DMSO-d6) δ 7.96 (br s, 1H), 7.39 (m, 5H), 6.35 (d, 1H), 5.20 (s, 2H), 4.49 (s, 2H), 3.92 (m, 1H), 1.74-1.60 (m, 6H), 1.50-1.40 (m, 1H), 1.33-1.15 (m, 4H), 0.90-0.75 (m, 2H).

EXAMPLE 118

```latex
\text{(([(2RS,3R)-3-aminoo-4-cyclohexyl-2-hydroxybutanoylamino]oxy)acetic acid}
```

EXAMPLE 118A

```latex
\text{(([(2RS,3R)-3-(tert-butoxycarbonyl)amino-4-cyclohexyl-2-hydroxybutanoylamino]oxy)acetic acid}
```

[0484] A solution of Example 117A (0.99 g, 2.1 mmol), and 10% Palladium on charcoal (0.21 g) in THF (10 mL) at room temperature was stirred for 4 hours under an atmosphere of hydrogen gas, filtered, and concentrated to provide the desired product.

[0485] MS(APCI) m/e 375 (M+H)+;

EXAMPLE 118B

```latex
\text{(([(2RS,3R)-3-aminoo-4-cyclohexyl-2-hydroxybutanoylamino]oxy)acetic acid}
```

[0486] Example 118A (0.17 g, 0.45 mmol) was dissolved in saturated HCl/dioxane (4 mL), stirred for 1 hour, concentrated, treated with diethyl ether, then concentrated to provide the desired product.

[0487] MS(APCI) m/e 275 (M+H)+;

[0488] 1H NMR (300 MHz, DMSO-d6) δ 7.96 (br s, 1H), 6.39 (d, 1H), 5.20 (s, 2H), 3.92 (m, 1H), 1.74-1.60 (m, 6H), 1.50-1.40 (m, 1H), 1.33-1.15 (m, 4H), 0.90-0.75 (m, 2H).
EXAMPLE 119
ethyl (2S)-2-(((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)amino)oxy)acetyl)amino)propanoate

[0489] A solution of Example 118A (0.17 g, 0.45 mmol), L-alanine ethyl ester hydrochloride (0.098 g, 0.64 mmol), 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide hydrochloride (0.098 g, 0.51 mmol), 1-hydroxybenzotriazole (0.091 g, 0.67 mmol), and N-methylmorpholine (0.11 mL, 1.0 mmol) in dichloromethane (5 mL) at room temperature was stirred for 16 hours, diluted with dichloromethane, washed sequentially with 1 M HCl, aqueous NaHCO₃, dried (MgSO₄), filtered, and concentrated. The concentrate was dissolved in saturated HCl/dioxane (4 mL), stirred for 1 hour, concentrated, then purified by HPLC to provide the desired product.

[0490] MS(ESI) m/z 374 (M+H)+

[0491] ¹H NMR (300 MHz, DMSO-d₆) δ 11.71 (br s, 1H), 8.56 (br s, 1H), 7.74 (br s, 2H), 6.55 (d, 1H), 4.35 (d, 2H), 4.29 (m, 1H), 4.09 (m, 2H), 4.03 (m, 1H), 1.74-1.60 (m, 6H), 1.40-1.35 (m, 1H), 1.31 (d, 3H), 1.33-1.35 (m, 4H), 1.19 (t, 3H), 0.96-0.80 (m, 2H).

EXAMPLE 120
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N-(2-oxo-2-(2-phenylethyl)amino)ethoxy)butanamide

[0492] The desired product was produced by substituting 2-phenylethylamine for L-alanine ethyl ester hydrochloride in Example 119.

[0493] MS (APCI) m/z 378 (M+H)+

[0494] ¹H NMR (300 MHz, DMSO-d₆) δ 11.69 (br s, 1H), 8.29 (br s, 1H), 7.75 (br s, 2H), 7.30 (m, 3H), 7.22 (m, 2H), 6.56 (d, 1H), 4.28 (d, 2H), 4.01 (m, 1H), 2.75 (m, 2H), 1.74-1.60 (m, 6H), 1.50-1.40 (m, 1H), 1.36 (m, 2H), 1.33-1.15 (m, 4H), 0.90-0.75 (m, 2H).

EXAMPLE 121
(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-N-benzylxypentanamide

[0495] The desired product was produced by substituting O-benzyl hydroxylamine hydrochloride for O-phenyl hydroxylamine hydrochloride in Example 98B.

[0496] MS(ESI) m/z 299 (M+H)+

[0497] ¹H NMR (300 MHz, DMSO-d₆) δ 11.51 (br s, 1H), 7.92 (br s, 0.3H), 7.84 (br s, 0.7H), 7.39 (m, 5H), 6.49 (d, 0.7H), 6.40 (d, 0.3H), 4.84 (s, 1.4H), 4.82 (s, 0.6H), 4.17 (m, 0.5H), 4.03 (m, 0.7H), 3.46 (m, 1H), 2.60 (m, 2H), 2.48 (q, 2H), 1.73 (m, 2H), 1.18 (t, 3H).

EXAMPLE 122
(2RS,3R)-3-amino-N-(benzylxoy)-3-cyclohexyl-2-hydroxypropanamide

EXAMPLE 122A
(2RS,3R)-3-amino-3-cyclohexyl-2-hydroxypropanoic acid

[0498] The desired product was produced by substituting (2R)-2-((tert-butoxycarbonyl)amino)-2-(cyclohexyl)ethanoic acid for (2R)-2-((tert-butoxycarbonyl)amino)-3-cyclohexylpropanoic acid in Examples 1A-C.

[0499] MS(ESI) m/z 288 (M+H)+

EXAMPLE 122B
(2RS,3R)-3-amino-N-(benzylxoy)-3-cyclohexyl-2-hydroxypropanamide

[0500] The desired product was prepared by substituting O-benzyl hydroxylamine hydrochloride for O-phenyl hydroxylamine hydrochloride and Example 122A for Example 98A in Example 98B.

[0501] MS(ESI) m/z 293 (M+H)+

[0502] ¹H NMR (300 MHz, DMSO-d₆) δ 11.52 (s, 1H), 7.73 (br s, 2H), 7.41 (m, 5H), 6.40 (m, 1H), 4.85 (s, 2H), 4.08 (m, 1H), 1.77-1.44 (m, 6H), 1.20-0.94 (m, 5H).

EXAMPLE 123
(2RS,3R)-3-amino-N-(benzylxoy)-2-hydroxy-5-(isopropylsulfonyl)pentanamide

EXAMPLE 123A
(2R)-2-((tert-butoxycarbonyl)amino)-4-(isopropylsulfonyl)butanoic acid

[0503] A solution of D-homocystine (20 g, 75 mmol) in liquid ammonia (600 mL) was treated sequentially with sodium (8.9 g, 390 mmol) and 2-bromopropane (20 mL, 210 mmol). The ammonia was allowed to evaporate under a stream of nitrogen, and the residues take up in 1:1 2-propanol/water (500 mL), then treated with di-tert-butyl dicarbonate (50 g, 230 mmol) at room temperature for 6 hours, then concentrated. The residues were taken up in water and the pH adjusted to 10 with NaOH. The solution was washed twice with ether, then adjusted to pH 2 with HCl, then extracted twice with ethyl acetate. The ethyl aceate extracts were dried (MgSO₄), filtered, then concentrated to provide the desired product.

[0504] MS(ESI) m/z 279 (M+H)+

EXAMPLE 123B
(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)-pentanoic acid

[0505] The desired product was prepared by substituting Example 123A for (2R)-2-((tert-butoxycarbonyl)amino)-3-cyclohexylpropanoic acid in Examples 1A-C.

[0506] MS(ESI) m/z 308 (M+H)+

EXAMPLE 123C
(2RS,3R)-3-amino-N-(benzyloxy)-2-hydroxy-5-(isopropylsulfonyl)pentanamide

[0507] The desired product was prepared by substituting O-benzyl hydroxylamine hydrochloride for O-phenyl hydroxylamine hydrochloride and Example 123B for Example 98A in Example 98B.

[0508] MS(ESI) m/z 315 (M+H)+

[0509] ¹H NMR (300 MHz, DMSO-d₆) δ 11.50 (br s, 1H), 7.92 (br s, 0.6H), 7.84 (br s, 1.4H), 7.40 (m, 5H), 6.48 (d,
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[0510] The desired product was prepared by substituting D-cystine for D-homocystine and 1-bromo-2-methylpropene for 2-bromopropane in Example 123A.

EXAMPLE 124
(2RS,3S)-3-amino-N-(benzoxyl)-2-hydroxy-4-(isobutylsulfanyl)butanamide

[0511] MS(ESI) m/z 279 (M+H)^+

EXAMPLE 124B
(2RS,3S)-3-((tert-butoxycarbonyl)amino)-2-hydroxy-4-(isobutylsulfanyl)butanoic acid

[0512] The desired product was prepared by substituting Example 124A for (2R)-2-((tert-butoxycarbonyl)amino)-3-cyclohexylpropanoic acid in Examples 1A-C.

[0513] MS(ESI) m/z 306 (M+H)^+

EXAMPLE 124C
(2RS,3S)-3-amino-N-(benzoxyl)-2-hydroxy-4-(isobutylsulfanyl)butanamide

[0514] The desired product was prepared by substituting O-benzyl hydroxylamine hydrochloride for O-phenyl hydroxylamine hydrochloride and Example 124B for Example 98A in Example 98B.

[0515] MS(ESI) m/z 360 (M+H)^+

[0516] 1H NMR (300 MHz, DMSO-d_6) δ 11.55 (br s, 1H), 7.93 (br s, 1H), 7.40 (m, 5H), 6.56 (m, 1H), 4.86 (s, 2H), 4.21 (m, 1H), 2.63 (m, 2H), 2.42 (d, 2H), 1.75 (m, 1H), 0.95 (d, 6H).

EXAMPLE 125
(2RS,3R)-3-amino-N-(benzoxyl)-2-hydroxy-5-phenylpentanamide

EXAMPLE 125A
(2RS,3R)-3-amino-2-hydroxy-5-phenylpentanoic acid

[0517] The desired product was prepared by substituting (2R)-2-((tert-butoxycarbonyl)amino)-4-phenylbutanoic acid for (2R)-2-((tert-butoxycarbonyl)amino)-3-cyclohexylpropanoic acid in Examples 1A-C.

[0518] MS(ESI) m/z 309 (M+H)^+

EXAMPLE 125B
(2RS,3R)-3-amino-N-(benzoxyl)-2-hydroxy-5-phenylpentanamide

[0519] The desired product was prepared by substituting O-benzyl hydroxylamine hydrochloride for O-phenyl hydroxylamine hydrochloride and Example 125A for Example 98A in Example 98B.

[0520] MS(ESI) m/z 315 (M+H)^+

[0521] 1H NMR (300 MHz, DMSO-d_6) δ 8.76 (br s, 2H), 7.35 (m, 5H), 7.20 (m, 5H), 6.48 (m, 1H), 4.82 (s, 2H), 4.05 (m, 1H), 2.65 (m, 2H), 1.78 (m, 2H).

EXAMPLE 126
(2RS,3S)-3-amino-N-(cyclohexylmethoxy)-2-hydroxy-4-(isobutylsulfanyl)butanamide

EXAMPLE 126A
O-Cyclohexylmethylhydroxylamine

[0522] The title compound was prepared by substituting cyclohexylmethyl bromide for Example 128A in Example 128B-128C.

[0523] 1H NMR (300 MHz, DMSO-d_6) δ 5.85 (s, 2H), 1.70-1.60 (m, 5H), 1.26-1.08 (m, 4H), 0.94-0.80 (m, 2H).

EXAMPLE 126B
(2RS,3S)-3-((tert-butoxycarbonyl)amino)-2-hydroxy-4-(isobutylsulfanyl)butanoic acid pentafluorophenyl ester

[0524] A solution of Example 124B (0.921 g, 3.0 mmol), pentafluorophenol (0.61 g, 3.3 mmol), 1-hydroxybenzotriazole (0.61 g, 4.5 mmol) and 1,3-dicyclohexyl-carbodiimide (0.62 g, 3.0 mmol in dichloromethane (10 mL) was stirred at 0°C for 1 h and room temperature for 18 h. Dicyclohexyl urea was removed by filtration, and the filtrate was diluted with ether, washed with NaHCO_3 and then brine, dried (MgSO_4), filtered, and concentrated. The crude material was purified by silica gel chromatography (10:90/ethylacetate:hexanes) to give the title compound.

[0525] MS(ESI) m/z 472 (M+H)^+

[0526] 1H NMR (300 MHz, DMSO-d_6) δ 6.64 (d, 1H), 6.10 (d, 1H), 4.85 (dd, 1H), 4.14 (m, 1H), 2.74 (m, 1H), 2.56 (m, 1H), 2.47 (d, 2H), 1.77 (m, 1H), 1.37 (s, 9H), 0.95 (d, 6H).

EXAMPLE 126C
(2RS,3S)-3-amino-N-(cyclohexylmethoxy)-2-hydroxy-4-(isobutylsulfanyl)butanamide

[0527] A solution of Example 126B (0.24 g, 0.5 mmol) and Example 126A (0.065 g, 0.5 mmol) in DMF (5 mL) was stirred at room temperature for 18h, diluted with ether, washed with brine, dried (Na_2SO_4) and concentrated, purified by silica gel chromatography (10:90/ethylacetate:hexanes), then treated with 4M HCl in dioxane to give the title compound.

[0528] MS(ESI) m/z 317 (M+H)^+

[0529] 1H NMR (300 MHz, DMSO-d_6) δ 11.38 (br s, 1H), 7.9 (br s, 2H), 6.5 (d, 1H), 4.18 (dd, 1H), 3.63 (d, 2H), 3.4 (m, 1H), 2.75-2.59 (m, 2H), 2.53 (d, 2H), 1.8-1.6 (m, 7H), 1.24-1.10 (m, 4H), 1.0-0.9 (m, 1H), 0.95 (d, 6H).
EXAMPLE 127

(2S,3S)-3-amino-2-hydroxy-4-(isobutylsulfanyl)-N-(mesitylmethoxy)butanamide

Example 127A
O-2,4,6-trimethylbenzylhydroxylamine

The title compound was prepared by substituting 2,4,6-trimethylbenzyl bromide for Example 128A in Example 128B-128C.

\[\text{[0530]}\] 1H NMR (300 MHz, DMSO-d$_6$) δ 6.80 (s, 2H), 5.96 (s, 2H), 4.57 (s, 2H), 2.30 (s, 6H), 2.20 (s, 3H).

EXAMPLE 127B

(2S,3S)-3-amino-2-hydroxy-4-(isobutylsulfanyl)-N-(mesitylmethoxy)butanamide

The title compound was prepared by substituting Example 127A for Example 126B in Example 126C.

\[\text{[0532]}\] MS(ESI) m/e 353 (M+H)+.

\[\text{[0534]}\] 1H NMR (300 MHz, DMSO-d$_6$) δ 11.55 (br s, 1H), 7.78 (br s, 2H), 6.85 (s, 2H), 6.57 (d, 1H), 4.87 (s, 2H), 4.24 (dd, 1H), 3.44 (m, 1H), 2.75-2.59 (m, 2H), 2.44 (d, 2H), 2.38 (s, 6H), 2.21 (s, 3H), 1.8-1.7 (m, 1H), 0.95 (d, 6H).

EXAMPLE 128

(2RS,3R)-3-amino-2-hydroxy-5-(ethylsulfanyl)-N-((IRS)-1-phenylethoxy)pentanamide

EXAMPLE 128A

1-bromoethylbenzene

\[\text{[0535]}\] To a solution of DL-sec-phenethyl alcohol (1.81 ml, 15 mmol) in chloroform (20 ml) was added phosphorus tribromide (15.75 ml, 15.75 mmol) dropwise at room temperature. The mixture was stirred at room temperature for 18 hours, poured into ice-water, washed with brine (4X), dried (MgSO$_4$), then evaporated to dryness to yield 2.62 g of the title compound.

EXAMPLE 128B

N-(1-phenylethoxy)phthalimide

\[\text{[0536]}\] N-hydroxyphthalimide (2.31g, 14.2 mmol), Example 128A (2.62g, 14.2 mmol) and potassium carbonate (4.91g, 35.5 mmol) in N,N-dimethylformamide (35 ml) were stirred at room temperature for 1 day, and stirred in 50º C. oil bath for 5 hours. The mixture was poured into ice-water, the precipitate was collected by filtration, washed with water and dried to yield 2.69g of the title compound.

EXAMPLE 128C

O-(1-phenylethyl)hydroxylamine

\[\text{[0537]}\] Example 128B (2.18g, 8.2 mmol) and hydrazine hydrate (0.306 ml, 9.84mmol) in ethanol (35 ml) was stirred at room temperature for 1.5 hours. The solvent was removed, the residue triturated with 30 ml of ether, filtered, and the filtrate was concentrated in vacuo to yield the title compound (1.09g) as an oil.

EXAMPLE 128D

(2RS,3R)-3-amino-2-hydroxy-5-(ethylsulfanyl)-N-((IRS)-1-phenylethoxy)pentanamide

\[\text{[0538]}\] The desired product was prepared by substituting Example 128C for O-phenyl hydroxylamine hydrochloride in Example 98B.

\[\text{[0539]}\] MS(ESI) m/e 313(M+H)+.

\[\text{[0540]}\] 1H NMR (300 MHz, DMSO-d$_6$) δ 11.28 (d, 0.5H), 11.23 (d, 0.5H), 7.89-8.08 (br, 3H), 7.28-7.43 (m, 5H), 6.43 (d, 0.4H), 6.33 (d, 0.4H), 4.92-5.03 (m, 1H), 4.17 (br, 0.4H), 3.98 (br, 0.6H), 2.42-2.67 (m, 4H), 1.60-1.75 (m, 2H), 1.42-1.46 (m, 3H), 1.13-1.21 (m, 3H).

EXAMPLE 129

(2S,3S)-3-amino-N-(benzoxyl)-2-hydroxy-4-(isobutylsulfanyl)-N-methylbutanamide

EXAMPLE 129A

N-methyl-O-benzylhydroxylamine hydrochloride

\[\text{[0541]}\] O-Benzylhydroxylamine hydrochloride (1.59 g, 0.01 mol), di-tert-butyl dicarbonate (2.18 g, 0.01 mol) and N-methyl morpholine (1.1 ml, 0.01 mol) in dichloromethane (40 ml) were stirred at room temperature for 16 hours. The reaction mixture was diluted with ether, washed with 10% NaHSO$_4$, then brine, dried over (Na$_2$SO$_4$), and concentrated. The residue was treated with methyl iodide (1.6 ml, 0.025 mmol) in the presence of NaH (0.4 g, 0.01 mol) in THF at 0º C., then stirred at room temperature for 16 hours. The reaction was quenched with 1N HCl, diluted with ether, washed with brine, dried (Na$_2$SO$_4$), concentrated, purified by silica gel chromatography (20:80/ethyl acetate/hexanes) and treated with 4M HCl in dioxane to give the title compound.

EXAMPLE 129B

(2S,3S)-3-amino-N-(benzyloxy)-2-hydroxy-4-(isobutylsulfanyl)-N-methylbutanamide

\[\text{[0542]}\] The title compound was prepared by substituting Example 129A for Example 126A in Example 126C.

\[\text{[0543]}\] MS(ESI) m/e 327 (M+H)+.

\[\text{[0544]}\] 1H NMR (300 MHz, DMSO-d$_6$) δ 8.79 (br s, 2H), 7.49 (m, 2H), 7.4 (m, 3H), 6.22 (br s, 1H), 4.98 (m, 2H), 4.79 (br s, 1H), 3.24 (s, 3H), 2.55 (m, 2H), 2.3 (m, 2H), 1.68 (m, 1H), 0.9 (d, 6H).

EXAMPLE 130

(2RS,3S)-3-amino-N-(benzyloxy)-2-hydroxy-5-(isopropylsulfanyl)-N-methylpentanamide

\[\text{[0545]}\] The desired product was prepared by substituting Example 129A for O-phenyl hydroxylamine hydrochloride and Example 125B for Example 98A in Example 98B.

\[\text{[0546]}\] MS(ESI) m/e 327 (M+H)+.
EXAMPLE 131

(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)-
N-((RS)-1-phenylethoxy)pentanamide

The desired product was prepared by substituting
Example 128C for 0-phenyl hydroxylamine hydrochloride
and Example 123B for Example 98A in Example 98B.

EXAMPLE 132

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N-
((3RS)-3-(methylsulfanyl)butyl)-N′-phenylbutanohy-
drazide

The desired product was prepared by substituting
1-(3-(methylsulfanyl)butyl)-1-phenylhydrazine for 1-
benzylhydrazidine dihydrochloride in Example 1.

EXAMPLE 133

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-phe-
nyl-N'-(3 phenylpropyl)butanohydrazone

The desired product was prepared by substituting
1-(3-phenylpropyl)-1-phenylhydrazine for 1-benzylhydrazine
dihydrochloride in Example 1.

EXAMPLE 134

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-
isobutyl-N'-phenylbutanohydrazone

The desired product was prepared by substituting
1-(2-methylpropyl)-1-phenylhydrazine for 1-benzylhydrazine
dihydrochloride in Example 1.

EXAMPLE 135

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-pen-
ty1-N'-phenylbutanohydrazone

The desired product was prepared by substituting
1-phenyl-1-phenylhydrazine for 1-benzylhydrazine dihydro-
chloride in Example 1.

EXAMPLE 136

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(2-
methylbutyl)-N'-phenylbutanohydrazone

The desired product was prepared by substituting
1-(2-methylbutyl)-1-phenylhydrazine for 1-benzylhydrazine
dihydrochloride in Example 1.

EXAMPLE 137

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-iso-
pentyl-N'-phenylbutanohydrazone

The desired product was prepared by substituting
1-(3-methylbutyl)-1-phenylhydrazine for 1-benzylhydrazine
dihydrochloride in Example 1.

EXAMPLE 138

(2RS,3R)-3-amino-4-cyclohexyl-N'-hexyl-2-hy-
droxy-N'-phenylbutanohydrazone

The desired product was prepared by substituting
1-hexyl-1-phenylhydrazine for 1-benzylhydrazine dihydro-
chloride in Example 1.

EXAMPLE 139

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'(2-
methylpentyl)-N'-phenylbutanohydrazone

The desired product was prepared by substituting
1-(2-methylpentyl)-1-phenylhydrazine for 1-benzylhydrazine
dihydrochloride in Example 1.
EXAMPLE 140

(2RS,3R)-3-aminoc-4-cyclohexyl-2-hydroxy-N-(3-methylpentyl)-N'-phenylbutanohydrazide

EXAMPLE 141

(2RS,3R)-3-aminoc-4-cyclohexyl-N-(3,3-dimethylbutyl)-2-hydroxy-N'-phenylbutanohydrazide

EXAMPLE 142

(2RS,3R)-3-aminoc-4-cyclohexyl-N'-(2-ethylbutyl)-2-hydroxy-N'-phenylbutanohydrazide

EXAMPLE 143

(2RS,3R)-3-aminoc-4-cyclohexyl-N'-(cyclopropylmethyl)-2-hydroxy-N'-phenylbutanohydrazide

EXAMPLE 144

(2RS,3R)-3-aminoc-4-cyclohexyl-N'-dodecyl-2-hydroxy-N'-phenylbutanohydrazide

EXAMPLE 145

(2RS,3R)-3-aminoc-4-cyclohexyl-2-hydroxy-N'-penthyl-N'-(3,5,5-trimethylhexyl)-phenylbutanohydrazide

EXAMPLE 146

(2RS,3R)-3-aminoc-4-cyclohexyl-2-hydroxy-N'-octyl-N'-phenylbutanohydrazide

EXAMPLE 147

(2RS,3R)-3-aminoc-4-benzyloxyethyl-4-cyclohexyl-2-hydroxy-N'-phenylbutanohydrazide

EXAMPLE 148

(2RS,3R)-3-aminoc-4-cyclohexyl-2-hydroxy-N'-penthyl-N'-(2,2,5,5-trichloropentyl)butanohydrazide

EXAMPLE 149

The desired product was prepared by substituting 1-(3,5,5-trimethylpentyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.
[0600] MS(ESI) m/z 464 (M+H)^+; 

[0601] 1H NMR (300 MHz, CD$_2$OD) δ 7.20 (m, 2H), 6.85 (m, 3H), 4.38 (d, 1H), 3.79 (m, 11H), 3.68 (m, 2H), 2.46 (m, 2H), 2.17 (m, 2H), 1.58-1.91 (m, 3H), 1.50 (m, 2H), 1.17-1.42 (m, 3H), 0.91 (m, 2H).

**EXAMPLE 149**

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-phenyl-N'-propylbutanohydrazide

[0602] The desired product was prepared by substituting 1-propyl-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0603] MS(ESI) m/z 334 (M+H)^+; 

[0604] 1H NMR (300 MHz, CD$_2$OD) δ 7.22 (m, 2H), 6.90 (m, 2H), 6.82 (m, 1H), 4.27 (d, 1H), 3.59 (m, 1H), 3.45 (m, 2H), 1.59-1.99 (m, 5H), 1.51 (m, 2H), 1.12-1.43 (m, 3H), 0.78-1.12 (m, 5H).

**EXAMPLE 150**

(2RS,3R)-3-amino-4-cyclohexyl-N'-heptyl-2-hydroxy-N'-phenylbutanohydrazide

[0605] The desired product was prepared by substituting 1-heptyl-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0606] MS(ESI) m/z 390 (M+H)^+; 

[0607] 1H NMR (300 MHz, CD$_2$OD) δ 7.22 (m, 2H), 6.88 (m, 2H), 6.82 (m, 1H), 4.27 (d, 1H), 3.66 (m, 1H), 3.45 (m, 2H), 1.59-1.96 (m, 5H), 1.52 (m, 2H), 1.12-1.45 (m, 11H), 0.83-1.12 (m, 5H).

**EXAMPLE 151**

(2RS,3R)-3-amino-4-cyclohexyl-N'-ethyl-2-hydroxy-N'-phenylbutanohydrazide

[0608] The desired product was prepared by substituting 1-ethyl-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0609] MS(ESI) m/z 320 (M+H)^+; 

[0610] 1H NMR (300 MHz, CD$_2$OD) δ 7.23 (m, 2H), 6.91 (m, 2H), 6.83 (m, 1H), 4.30 (d, 1H), 3.61 (m, 1H), 3.54 (dd, 2H), 1.59-1.92 (m, 6H), 1.50 (m, 2H), 1.4-1.12 (m, 3H), 1.22 (t, 3H), 0.85-1.18 (m, 2H).

**EXAMPLE 152**

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-3-(methylsulfanyl)propyl)-N'-phenylbutanohydrazide

[0611]

[0612] The desired product was prepared by substituting 1-(3-(methylsulfanyl)propyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0613] MS(ESI) m/z 380 (M+H)^+; 

[0614] 1H NMR (300 MLz, CD$_2$OD) δ 7.22 (m, 2H), 6.92 (m, 2H), 6.83 (m, 1H), 4.28 (d, 1H), 3.47-3.72 (m, 3H), 2.50-2.75 (m, 2H), 2.10 (s, 3H), 1.93 (m, 2H), 1.58-1.87 (m, 6H), 1.51 (m, 2H), 1.13-1.42 (m, 3H), 0.82-1.12 (m, 2H).

**EXAMPLE 153**

(2RS,3R)-3-amino-4-cyclohexyl-N'(cyclopentylmethyl)-2-hydroxy-N' phenylbutanohydrazide

[0615] The desired product was prepared by substituting 1-(cyclopentylmethyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0616] MS(ESI) m/z 374 (M+H)^+; 

[0617] 1H NMR (300 MHz, CD$_2$OD) δ 7.21 (m, 2H), 6.89 (m, 2H), 6.82 (m, 1H), 4.25 (d, 1H), 3.54 (dt, 1H), 3.41 (d, 2H), 2.26 (m, 1H), 1.42-2.00 (m, 15H), 1.10-1.43 (m, 5H), 0.80-1.10 (m, 2H).

**EXAMPLE 154**

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-5-hydroxyxypentyl)-N' phenylbutanohydrazide

[0618] The desired product was prepared by substituting 1-(5-hydroxyxypentyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0619] MS(ESI) m/z 378 (M+H)^+; 

[0620] 1H NMR (300 MHz, CD$_2$OD) δ 7.22 (m, 2H), 6.90 (m, 2H), 6.82 (m, 1H), 4.28 (d, 1H), 3.68 (m, 1H), 3.57 (t, 2H), 3.48 (m, 2H), 1.41-2.11 (m, 14H), 1.12-1.41 (m, 4H), 0.80-1.12 (m, 2H).

**EXAMPLE 155**

(2RS,3R)-3-amino-4-cyclohexyl-N'(2R)-2,3-dihydroxypropyl)-2-hydroxy-N'-phenylbutanohydrazide

[0621] The desired product was prepared by substituting 1-(2R)-2,3-dihydroxypropyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0622] MS(ESI) m/z 366 (M+H)^+; 

[0623] 1H NMR (300 MHz, CD$_2$OD) δ 7.20 (m, 2H), 6.86 (m, 3H), 4.27 (d, 1H), 3.62 (m, 3H), 3.28 (d, 4H), 1.58-1.91 (m, 6H), 1.50 (m, 2H), 1.17-1.42 (m, 3H), 0.91 (m, 2H).

**EXAMPLE 156**

(2RS,3R)-3-amino-4-cyclohexyl-N'(2,2-dichlorohexyl)-2-hydroxy-N' phenylbutanohydrazide

[0624] The desired product was prepared by substituting 1-(2,2-dichlorohexyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0625] MS(ESI) m/z 444 (M+H)^+; 

[0626] 1H NMR (300 MHz, CD$_2$OD) δ 7.20 (m, 2H), 6.87 (m, 3H), 4.29 (d, 1H), 3.37 (m, 3H), 2.27 (m, 2H), 1.58-1.91 (m, 6H), 1.50 (m, 4H), 1.17-1.42 (m, 5H), 1.05 (m, 2H), 0.92 (t, 3H).

**EXAMPLE 157**

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-((3RS)-7-methoxy-3,7-dimethylstyryl)-N'-phenylbutanohydrazide

[0627] The desired product was prepared by substituting 1-(7-methoxy-3,7-dimethylstyryl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.
[0628] MS(ESI) m/z 462 (M+H)+;

[0629] 1H NMR (300 MHz, CD3OD) δ 7.23 (m, 2H), 6.89 (m, 2H), 6.83 (m, 1H), 4.27 (s, 1H), 3.38-3.65 (m, 3H), 3.17 (s, 3H), 1.14 (s, 6H), 0.97 (d, 3H), 0.85-1.12 (m, 2H), 0.85-1.12 (m, 2H).

EXAMPLE 158

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N′-[(2-((4-methylphenyl)ethyl)-N′-phenylbutanoyl)hydrazide

[0630] The desired product was prepared by substituting 1-(2-(4-methylphenyl)ethyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0631] MS(ESI) m/z 410 (M+H)+;

[0632] 1H NMR (300 MHz, CD3OD) δ 7.24 (m, 2H), 7.13 (m, 4H), 6.91 (m, 2H), 6.83 (m, 1H), 4.29 (d, 1H), 3.69 (m, 2H), 3.57 (m, 1H), 2.90 (t, 2H), 2.30 (s, 3H), 1.59-1.95 (m, 5H), 1.50 (m, 2H), 1.12-1.40 (m, 4H), 0.75-1.12 (m, 2H).

EXAMPLE 159

(2RS,3R)-3-amino-4-cyclohexyl-N′-[(2RS)-2-ethylhexyl]-2-hydroxy-N′-phenylbutanoylhydrazide

[0633] The desired product was prepared by substituting 1-(2-ethylhexyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0634] MS(ESI) m/z 404 (M+H)+;

[0635] 1H NMR (300 MHz, CD3OD) δ 7.21 (m, 2H), 6.88 (m, 2H), 6.81 (m, 1H), 4.23 (m, 1H), 3.52 (dt, 1H), 3.37 (m, 2H), 1.61-1.92 (m, 6H), 1.10-1.61 (m, 14H), 0.75-1.10 (m, 8H).

EXAMPLE 160

(2RS,3R)-3-amino-N′-[(2RS)-2-(4-chlorophenyl)-2-cyanoethyl]-4-cyclohexyl-2-hydroxy-N′-phenylbutanoylhydrazide

[0636] The desired product was prepared by substituting 1-(2-(4-chlorophenyl)-2-cyanoethyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0637] MS(ESI) m/z 456 (M+H)+;

[0638] 1H NMR (300 MHz, CD3OD) δ 7.50-7.10 (m, 9H), 6.84 (m, 1H), 4.57 (d, 1H), 3.82 (m, 1H), 3.41 (m, 2H), 1.58-1.91 (m, 6H), 1.50 (m, 2H), 1.17-1.42 (m, 3H), 0.91 (m, 2H).

EXAMPLE 161

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N′-phenyl-N′-[(2RS)-2-phenylpropyl]butanoylhydrazide

[0639] The desired product was prepared by substituting 1-(2-phenylpropyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0640] MS(ESI) m/z 410 (M+H)+;

[0641] 1H NMR (300 MHz, CD3OD) δ 7.32 (m, 5H), 7.18 (m, 2H), 6.87 (m, 2H), 6.80 (m, 1H), 4.18 (d, 1H), 3.65 (m, 2H), 3.52 (m, 1H), 3.13 (m, 1H), 1.58-1.91 (m, 6H), 1.50 (m, 2H), 1.17-1.42 (m, 3H), 1.37 (d, 3H), 0.91 (m, 2H).

EXAMPLE 162

(2RS,3R)-3-amino-4-cyclohexyl-N′-(cyclooctylmethyl)-2-hydroxy-N′-phenylbutanoylhydrazide

[0642] The desired product was prepared by substituting 1-(cyclooctylmethyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0643] MS(ESI) m/z 416 (M+H)+;

[0644] 1H NMR (300 MHz, CD3OD) δ 7.20 (m, 2H), 6.88 (m, 2H), 6.80 (m, 1H), 4.24 (d, 1H), 3.53 (dt, 1H), 3.27 (m, 2H), 1.11-2.08 (m, 2H), 0.82-1.11 (m, 2H).

EXAMPLE 163

(2RS,3R)-3-amino-4-cyclohexyl-N′-[(11Z)-11-hexadecenyl]-2-hydroxy-N′-phenylbutanoylhydrazide

[0645] The desired product was prepared by substituting 1-[(11Z)-11-hexadecenyl]-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0646] MS(ESI) m/z 514 (M+H)+;

[0647] 1H NMR (300 MHz, CD3OD) δ 7.22 (m, 2H), 6.88 (m, 2H), 6.82 (m, 1H), 5.34 (m, 2H), 4.27 (d, 1H), 3.56 (dt, 1H), 3.46 (m, 2H), 1.92-2.14 (m, 4H), 1.58-1.92 (m, 7H), 1.51 (m, 2H), 1.12-1.44 (m, 22H), 0.94-1.12 (m, 2H), 0.89 (m, 3H).

EXAMPLE 164

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N′-phenyl-N′-tridecylbutanoylhydrazide

[0648] The desired product was prepared by substituting 1-tridecyl-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

[0649] MS(ESI) m/z 474 (M+H)+;

[0650] 1H NMR (300 MHz, CD3OD) δ 7.22 (m, 2H), 6.90 (m, 2H), 6.83 (m, 1H), 4.27 (d, 1H), 3.56 (m, 1H), 3.46 (m, 2H), 1.57-1.91 (m, 7H), 1.51 (m, 2H), 1.12-1.44 (m, 22H), 1.01 (m, 2H), 0.90 (t, 3H).

EXAMPLE 165

4-(2-[(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl]-1-phenylhydrazino)butanoic acid

[0651] The desired product was prepared by substituting 4-(1-phenylhydrazino)butanoic acid for 1-benzylhydrazine dihydrochloride in Example 1.

[0652] MS(ESI) m/z 378 (M+H)+;

[0653] 1H NMR (300 MHz, CD3OD) δ 7.23 (m, 2H), 6.88 (m, 3H), 4.29 (m, 1H), 3.64 (m, 1H), 3.53 (m, 1H), 3.31 (m, 1H), 2.46 (t, 1H), 1.94 (m, 1H), 1.59-1.88 (m, 7H), 1.50 (m, 3H), 1.12-1.41 (m, 4H), 0.86-1.12 (m, 2H).

EXAMPLE 166

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N′-((6Z)-6-nonenyl)-N′-phenylbutanoylhydrazide

[0654] The desired product was prepared by substituting 1-((6Z)-6-nonenyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.
EXAMPLE 167

(2RS,3R)-3-amino-4-cyclohexyl-N-((4Z)-4-decene)-1-hydroxy-N'-phenylbutanohydrizide

The desired product was prepared by substituting 1-(4-(Z)-4-deceny)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

EXAMPLE 168

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N’-(4-penteny1)-N’-phenylbutanohydrizide

The desired product was prepared by substituting 1-(4-pentenyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

EXAMPLE 169

(2RS,3R)-3-amino-4-cyclohexyl-N’-(3RS)-3,7-dimethyl-6-octenyl)-2-hydroxy-N’-phenylbutanohydrizide

The desired product was prepared by substituting 1-(3,7-dimethyl-6-octenyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

EXAMPLE 170

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N’-phenyl-N’-(4,4-trifluorobutyl)butanohydrizide

The desired product was prepared by substituting 1-(4,4-trifluorobutyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

EXAMPLE 171

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N’-((3RS)-3-hydroxybutyl)-N’-phenylbutanohydrizide

The desired product was prepared by substituting 1-(3-hydroxybutyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

EXAMPLE 172

(2RS,3R)-3-amino-4-cyclohexyl-N’-((3RS)-3,7-dimethyl-6-octenyl)oxyethyl)-2-hydroxy-N’-phenylbutanohydrizide

The desired product was prepared by substituting 1-(2-(3,7-dimethyl-6-octenyl)oxyethyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

EXAMPLE 173

(2RS,3R)-3-amino-4-cyclohexyl-N’-((4RS)-3,3-dimethylcyclohexyl)ethyl)-2-hydroxy-N’-phenylbutanohydrizide

The desired product was prepared by substituting 1-(2-(3,3-dimethylcyclohexyl)ethyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

EXAMPLE 174

(2RS,3R)-3-amino-N’-((4S)-6-bromo-4-methylhexyl)-4-cyclohexyl-2-hydroxy-N’-phenylbutanohydrizide

The desired product was prepared by substituting 1-(4(S)-6-bromo-4-methylhexyl)-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.

EXAMPLE 175

(2RS,3R)-3-amino-4-cyclohexyl-N’-(cyclohexylmethyl)-2-hydroxy-N’-phenylbutanohydrizide

The desired product was prepared by substituting 1-cyclohexylmethyl-1-phenylhydrazine for 1-benzylhydrazine dihydrochloride in Example 1.
[0682] MS(ESI) m/e 388 (M+H)+;

[0683] 1H NMR (300 MHz, CD₂OD) δ 7.21 (m, 2H), 6.86 (m, 2H), 6.80 (m, 1H), 4.25 (d, 1H), 3.54 (dt, 1H), 3.31 (d, 2H), 1.92 (m, 2H), 1.59-1.84 (m, 10H), 1.51 (m, 2H), 1.13-1.42 (m, 6H), 0.81-1.13 (m, 4H).

EXAMPLE 176

((2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxypentanoyl)-2-naphthohydrazide

[0684] The desired product was prepared by substituting 2-naphthoylhydrazine for O-phenyl hydroxylamine hydrochloride in Example 98B.

[0685] MS(ESI) m/e 362 (M+H)+;

[0686] 1H NMR (300 MHz, CD₂OD) δ 8.48 (m, 1H), 7.89-8.09 (m, 4H), 7.47-7.75 (m, 2H), 4.54 (d, 0.34H), 4.48 (d, 0.66H), 3.56-3.87 (m, 1H), 2.76 (m, 2H), 2.62 (q, 1.32H), 2.60 (q, 0.68H), 2.10-2.31 (m, 0.68H), 1.84-2.08 (m, 1.32H), 1.28 (t, 1.98H), 1.27 (t, 1.02H).

EXAMPLE 177

(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-N-(1-piperidinyl)pentanamide

[0687] The desired product was prepared by substituting 1-aminopiperidine for O-phenyl hydroxylamine hydrochloride in Example 98B.

[0688] MS(ESI) m/e 276 (M+H)+;

[0689] 1H NMR (300 MHz, CD₂OD) δ 4.67 (m, 0.28H), 4.62 (m, 0.72H), 3.37-3.78 (m, 5H), 2.72-3.16 (m, 4H), 2.00-2.30 (m, 2H), 1.70 (m, 1H), 1.57 (m, 2H), 1.35 (t, 2.16H), 1.33 (m, 0.84H).

EXAMPLE 178

N’-(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoylbenzohydrazide

[0690] The desired product was prepared by substituting benzoylhydrazine for O-phenyl hydroxylamine hydrochloride in Example 98B.

[0691] MS(ESI) m/e 312 (M+H)+;

[0692] 1H NMR (300 MHz, CD₂OD) δ 7.89 (m, 2H), 7.61 (m, 1H), 7.50 (m, 2H), 4.49 (d, 0.24H), 4.44 (d, 0.76H), 3.79 (m, 1H), 2.71 (t, 2H), 2.60 (q, 2H), 2.17 (m, 1H), 1.99 (m, 1H), 1.27 (t, 3H).  

EXAMPLE 179

(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-N’-(4-iodophenyl)pentanohydrazide

[0693] The desired product was prepared by substituting 1-(4-iodophenyl)hydrazine for 1-benzyllhydrazine dihydrochloride and Example 98A for Example 1C in Example 1D.

[0694] MS(ESI) m/e 410 (M+H)+;

[0695] 1H NMR (300 MHz, CD₂OD) δ 7.48 (m, 2H), 6.67 (m, 2H), 4.43 (d, 0.38H), 4.36 (d, 0.62H), 3.74 (m, 1H), 2.72 (m, 2H), 2.57 (q, 0.76H), 2.51 (q, 1.24H), 2.11 (m, 0.76H), 1.93 (m, 1.24H), 1.26 (t, 1.86H), 1.22 (t, 1.14H).

EXAMPLE 180

(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-N’-(cyclopenta[1]-pentanohydrazide

[0696] The desired product was prepared by substituting 1-cyclopentylhydrazine for 1-benzyllhydrazine dihydrochloride and Example 98A for Example 1C in Example 1D.

[0697] MS(ESI) m/e 276 (M+H)+;

[0698] 1H NMR (300 MHz, CD₂OD) δ 4.36 (d, 0.23H), 4.27 (d, 0.77H), 3.67 (d, 1H), 3.53 (m, 1H), 2.68 (m, 2H), 2.57 (q, 1.54H), 2.54 (q, 0.46H), 2.07 (m, 0.46H), 1.91 (m, 1.54H), 1.76 (m, 4H), 1.44-1.67 (m, 4H), 1.26 (t, 2.31H), 1.24 (t, 0.69H).

EXAMPLE 181

(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-N’-(3-chlorophenyl)pentanohydrazide

[0699] The desired product was prepared by substituting 1-(3-chlorophenyl)hydrazine for 1-benzyllhydrazine dihydrochloride and Example 98A for Example 1C in Example 1D.

[0700] MS(ESI) m/e 318 (M+H)+;

[0701] 1H NMR (300 MHz, CD₂OD) δ 7.15 (m, 1H), 6.85 (m, 1H), 6.77 (m, 2H), 5.98 (d, 0.32H), 5.85 (d, 0.68H), 3.71 (m, 1H), 3.43 (q, 1.36H), 3.36 (q, 0.64H), 2.70 (m, 2H), 2.11 (m, 0.64H), 1.95 (m, 1.36H), 1.67 (t, 2.04H), 1.63 (t, 0.96H).

EXAMPLE 182

(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-N’-(3-methoxyphenyl)pentanohydrazide

[0702] The desired product was prepared by substituting 1-(3-methoxyphenyl)hydrazine for 1-benzyllhydrazine dihydrochloride and Example 98A for Example 1C in Example 1D.

[0703] MS(ESI) m/e 314 (M+H)+;

[0704] 1H NMR (300 MHz, CD₂OD) δ 7.09 (m, 1H), 6.44 (m, 3H), 4.43 (d, 0.37H), 4.36 (d, 0.63H), 3.75 (s, 3H), 3.69 (m, 1H), 2.71 (m, 2H), 2.57 (q, 1.26H), 2.50 (q, 0.74H), 2.12 (m, 0.74H), 1.82-2.04 (m, 1.26H), 1.25 (t, 1.89H), 1.21 (t, 1.11H).

EXAMPLE 183

(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-N’-(2-chlorophenyl)pentanohydrazide

[0705] The desired product was prepared by substituting 1-(2-chlorophenyl)hydrazine for 1-benzyllhydrazine dihydrochloride and Example 98A for Example 1C in Example 1D.

[0706] MS(ESI) m/e 318 (M+H)+;

[0707] 1H NMR (300 MHz, CD₂OD) δ 7.29 (m, 1H), 7.17 (m, 1H), 6.93 (m, 1H), 6.83 (m, 1H), 4.47 (d, 0.23H), 4.41 (d, 0.77H), 3.76 (m, 1H), 2.71 (m, 2H), 2.58 (q, 1.54H), 2.52 (q, 0.46H), 2.13 (td, 0.46H), 1.95 (m, 1.54H), 1.26 (t, 2.31H), 1.22 (t, 0.69H).
EXAMPLE 184

(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-
(3-trifluoromethylphenyl)pentanohydrazide

[0708] The desired product was prepared by substituting 1-(3-(trifluoromethyl)phenyl)hydrazine for 1-benzylhydrazine dihydrochloride and Example 98A for Example 1C in Example 1D.

[0709] MS(ESI) m/z 352 (M+H)+;

[0710] 1H NMR (300 MHz, CD3OD) δ 7.37 (m, 1H), 7.08 (m, 3H), 4.48 (d, 0.39H), 4.40 (d, 0.61H), 3.69 (m, 1H), 2.71 (m, 2H), 2.57 (q, 1.32H), 2.51 (q, 0.78H), 2.13 (m, 0.78H), 1.84-2.05 (m, 1.22H), 1.25 (t, 1.83H), 1.21 (t, 1.17H).

EXAMPLE 185

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-
pentanoylhydrazide-3-chlorobenzohydrazide

[0711] The desired product was prepared by substituting 3-chlorobenzoylhydrazine for O-phenyl hydroxylamine hydrochloride in Example 98B.

[0712] MS(ESI) m/z 346 (M+H)+;

[0713] 1H NMR (300 MHz, CD3OD) δ 7.89 (m, 1H), 7.81 (m, 1H), 7.61 (m, 1H), 7.50 (m, 1H), 4.49 (d, 0.14H), 4.44 (d, 0.86H), 3.78 (m, 1H), 2.70 (t, 2H), 2.60 (dd, 2H), 2.16 (m, 1H), 1.98 (m, 1H), 1.27 (t, 3H).

EXAMPLE 186

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-
pentanoylhydrazide-2-chlorobenzohydrazide

[0714] The desired product was prepared by substituting 2-chlorobenzoylhydrazine for O-phenyl hydroxylamine hydrochloride in Example 98B.

[0715] MS(ESI) m/z 346 (M+H)+;

[0716] 1H NMR (300 MHz, CD3OD) δ 7.62 (m, 1H), 7.46 (m, 3H), 4.49 (d, 0.26H), 4.43 (d, 0.74H), 3.80 (m, 1H), 2.71 (t, 2H), 2.60 (q, 0.52H), 2.57 (q, 1.48H), 2.16 (m, 0.52H), 1.99 (m, 1.48H), 1.27 (t, 2.22H), 1.24 (t, 0.78H).

EXAMPLE 187

(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-
(4-isopropyl)pentanohydrazide

[0717] The desired product was prepared by substituting 1-(4-(2-methylphenyl)phenyl)hydrazine for 1-benzylhydrazine dihydrochloride and Example 98A for Example 1C in Example 1D.

[0718] MS(ESI) m/z 326 (M+H)+;

[0719] 1H NMR (300 MHz, CD3OD) δ 7.02 (d, 2H), 6.77 (d, 2H), 4.42 (d, 0.41H), 4.35 (d, 0.59H), 3.74 (m, 1H), 2.61-2.81 (m, 2H), 2.55 (m, 3H), 2.02-2.24 (m, 0.82H), 1.81-2.02 (m, 1.18H), 1.26 (t, 1.77H), 1.22 (t, 1.23H), 1.17 (d, 6H).

EXAMPLE 188

(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-
(3-chloro-4-methylphenyl)pentanohydrazide

[0720] The desired product was prepared by substituting 1-(3-chloro-4-methylphenyl)hydrazine for 1-benzylhydrazine dihydrochloride and Example 98A for Example 1C in Example 1D.

[0721] MS(ESI) m/z 332 (M+H)+;

[0722] 1H NMR (300 MHz, CD3OD) δ 7.09 (m, 1H), 6.86 (m, 1H), 6.71 (m, 1H), 4.43 (d, 0.33H), 4.36 (d, 0.67H), 3.73 (m, 1H), 2.71 (m, 2H), 2.57 (q, 1.34H), 2.50 (q, 0.66H), 2.25 (m, 3H), 2.12 (m, 0.66H), 1.82-2.04 (m, 1.34H), 1.25 (t, 2.01H), 1.21 (t, 1.1H).

EXAMPLE 189

(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(3-fluorophenyl)pentanohydrazide

[0723] The desired product was prepared by substituting 1-(3-fluorophenyl)hydrazine for 1-benzylhydrazine dihydrochloride and Example 98A for Example 1C in Example 1D.

[0724] MS(ESI) m/z 302 (M+H)+;

[0725] 1H NMR (400 MHz, CD3OD) δ 7.15 (m, 1H), 6.64 (m, 1H), 6.52 (m, 2H), 4.48 (d, 0.37H), 4.38 (d, 0.63H), 3.80 (m, 0.37H), 3.70 (m, 0.63H), 2.70 (m, 2H), 2.57 (q, 1.23H), 2.52 (q, 0.74H), 2.12 (m, 0.74H), 1.95 (m, 1.23H), 1.25 (t, 1.89H), 1.22 (t, 1.11H).

EXAMPLE 190

(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(2-ethylphenyl)pentanohydrazide

[0726] The desired product was prepared by substituting 1-(2-ethylphenyl)hydrazine for 1-benzylhydrazine dihydrochloride and Example 98A for Example 1C in Example 1D.

[0727] MS(ESI) m/z 312 (M+H)+;

[0728] 1H NMR (300 MHz, CD3OD) δ 7.07 (m, 1H), 6.90 (m, 1H), 6.86 (m, 1H), 6.73 (m, 1H), 4.44 (d, 0.26H), 4.37 (d, 0.74H), 3.80 (m, 1H), 2.45-2.71 (m, 6H), 2.02 (m, 2H), 1.15-1.27 (m, 6H).

EXAMPLE 191

(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(4-fluorophenyl)pentanohydrazide

[0729] The desired product was prepared by substituting 1-(4-fluorophenyl)hydrazine for 1-benzylhydrazine dihydrochloride and Example 98A for Example 1C in Example 1D.

[0730] MS(ESI) m/z 302 (M+H)+;

[0731] 1H NMR (300 MHz, CD3OD) δ 6.96 (m, 2H), 6.84 (m, 2H), 4.42 (d, 0.41H), 4.35 (d, 0.59H), 3.74 (m, 1H), 2.61-2.81 (m, 2H), 2.57 (q, 1.18H), 2.51 (q, 0.82H), 2.02-2.24 (m, 0.82H), 1.81-2.02 (m, 1.18H), 1.26 (t, 1.77H), 1.22 (t, 1.23H).

EXAMPLE 192

(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(4-trifluoromethoxyphenyl)pentanohydrazide

[0732] The desired product was prepared by substituting 1-(4-(trifluoromethoxy)phenyl)hydrazine for 1-benzylhydrazine dihydrochloride and Example 98A for Example 1C in Example 1D.

[0733] MS(ESI) m/z 368 (M+H)+;
EXAMPLE 193

(2RS,3S)-3-amino-4-(ethylsulfanyl)-2-hydroxy-N'-(4-methylphenyl)butanohydrazone

To DCC resin (148 mg, 0.225 mmol) in 1.0 mL of dichloromethane was added 0.5 mL of a 0.45 M solution of HOBr (0.225 mmol) in dimethylacetamide/dichloromethane (1:6), and 0.5 mL of a 0.3M solution of Example 79A (0.15 mmol) in dimethylacetamide. After 5 minutes, 1.0 mL of a 0.225 M solution of 4-methylphenylhydrazine (0.225 mmol) in dimethylacetamide/dichloromethane (1:1) was added. The mixture was agitated for 18 hours and quenched with 0.19 g of trisamine resin (0.75 mmol) followed by 0.13 g of isocyanate resin (0.225 mmol) and agitated for 4 hours. The mixture was filtered and the resin washed with 1x3 mL of dichloromethane, the solvent was removed in vacuo, and the crude material purified by reverse phase preparative HPLC. The resulting material was treated with 1 mL of 50% trifluoroacetic acid/dichloromethane and agitated at ambient temperature for 18 hours. The solvent was removed in vacuo to give the desired product.

[0734] H NMR (300 MHz, CD$_2$OD) δ 7.00-7.20 (m, 2H), 6.87 (m, 2H), 4.44 (d, 0.42Hz), 4.37 (d, 0.58Hz), 3.63-3.83 (m, 3H), 2.71 (m, 2H), 2.57 (q, 1.16Hz), 2.51 (q, 0.84Hz), 2.11 (m, 0.84Hz), 1.82-2.03 (m, 1.16Hz), 1.25 (t, 1.74Hz), 1.22 (t, 1.26Hz).

EXAMPLE 194

(2RS,3R)-3-amino-3-cyclohexyl-2-hydroxy-N'-4-methylphenyl)propanohydrazone

The desired product was prepared by substituting Example 122A for Example 79A in Example 193.

[0736] MS(ESI) m/e 284 (M+H)*

[0737] H NMR (500 MHz, CD$_2$OD) δ 7.02 (m, 2H), 6.77 (m, 2H), 5.41 (d, 0.65Hz), 4.39 (d, 0.35Hz), 3.77 (m, 3H), 2.96 (dd, 1H), 2.76 (dd, 1H), 2.63 (dd, 1H), 2.57 (dd, 0.7Hz), 2.23 (s, 3H), 1.26 (t, 1.95Hz), 1.23 (t, 1.05Hz).

EXAMPLE 195

(2RS,3S)-3-amino-2-hydroxy-N'(4-methylphenyl)-4-propylsulfanyl)butanohydrazone

[0740] H NMR (500 MHz, CD$_2$OD) δ 7.02 (m, 2H), 6.77 (m, 2H), 4.45 (d, 0.65Hz), 4.43 (d, 0.35Hz), 3.27 (m, 1H), 2.23 (s, 3H), 1.87-1.72 (m, 6H), 1.36-1.12 (m, 5H).

EXAMPLE 195A

(2S)-2-((tert-butoxycarbonyl)amino)-3-(propylsulfanyl)propanoic acid

The desired product was prepared by substituting 1-bromopropane for 2-bromopropane and D-cystine for D-homocystine in Example 123A.

EXAMPLE 195B

(2RS,3S)-2-hydroxy-3-((tert-butoxycarbonyl)amino)-3-(propylsulfanyl)propanoic acid

The desired product was prepared by substituting Example 195A for (2R)-2-((tert-butoxycarbonyl)amino)-3-cyclohexylpropanoic acid in Examples 1A-C.

[0741] MS(ESI) m/e 294 (M+H)*

EXAMPLE 195C

(2RS,3S)-3-amino-2-hydroxy-N'-(4-methylphenyl)-4-propylsulfanyl)butanohydrazone

[0744] The desired product was prepared by substituting Example 195B for Example 97A in Example 193.

[0745] MS(ESI) m/e 298 (M+H)*

[0746] H NMR (500 MHz, CD$_2$OD) δ 7.02 (dd, 2H), 6.77 (dd, 2H), 4.50 (d, 0.65Hz), 4.48 (d, 0.35Hz), 3.76 (m, 0.65Hz), 3.67-3.58 (m, 0.35Hz), 2.93 (dd, 0.65Hz), 2.84 (dd, 0.35Hz), 2.75 (m, 1H), 2.58 (dd, 1H), 2.51 (m, 1H), 2.23 (s, 3H), 1.65 (dd, 1H), 1.57 (dd, 1H), 1.02 (t, 1.95Hz), 0.98 (t, 1.05Hz).

EXAMPLE 196

(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)-N'-(4-methylphenyl)pentanohydrazone

[0747] The desired product was prepared by substituting Example 123B for Example 97A in Example 193.

[0748] MS(ESI) m/e 312 (M+H)*

[0749] H NMR (500 MHz, CD$_2$OD) δ 7.01 (dd, 2H), 6.77 (dd, 2H), 4.40 (d, 0.35Hz), 4.33 (d, 0.65Hz), 3.60 (m, 1H), 2.96 (dd, 0.65Hz), 2.89 (dd, 0.35Hz), 2.69 (m, 1.05Hz), 2.58 (m, 0.35Hz), 2.23 (s, 3H), 2.09 (dd, 0.65Hz), 1.96 (dd, 0.35Hz), 1.89 (dd, 1H), 1.27 (d, 3H), 1.26 (d, 3H).

EXAMPLE 197

(2RS,3S)-3-amino-2-hydroxy-4-(isobutylsulfanyl)-N'-(4-methylphenyl)butanohydrazone

[0750] The desired product was prepared by substituting Example 124B for Example 97A in Example 193.

[0751] MS(ESI) m/e 312 (M+H)*

[0752] H NMR (500 MHz, CD$_2$OD) δ 7.02 (dd, 2H), 6.77 (dd, 2H), 4.52 (dd, 1H), 3.65 (dd, 1H), 2.94 (dd, 1H), 2.75 (dd, 1H), 2.51 (d, 2H), 2.23 (s, 3H), 1.82 (dd, 1H), 1.02 (d, 6H).

EXAMPLE 198

(2RS,3R)-3-amino-2-hydroxy-5-phenyl-N'-(4-methylphenyl)pentanohydrazone

[0753] The desired product was prepared by substituting Example 125A for Example 97A in Example 193.

[0754] MS(ESI) m/e 314 (M+H)*

[0755] H NMR (500 MHz, CD$_2$OD) δ 7.30 (m, 2H), 7.25-7.18 (m, 3H), 6.97 (m, 2H), 6.74 (m, 2H), 4.43 (d, 0.5Hz), 4.40 (d, 0.5Hz), 3.57 (m, 1H), 2.78 (m, 1.5Hz), 2.67 (m, 0.5Hz), 2.27 (m, 0.5Hz), 2.23 (s, 1.5Hz), 2.21 (s, 1.5Hz), 2.14 (m, 0.5Hz), 2.00 (m, 0.5Hz), 1.93 (m, 0.5Hz).

EXAMPLE 199

(2S,3R)-3-amino-3-cyclooctyl-2-hydroxy-N'-(4-methylphenyl)propanohydrazone

[0756] The desired product was prepared by substituting cyclooctyl aldehyde for 2-ethylhexanal in Examples 236A-236C.
EXAMPLE 199B
(2S,3R)-3-amino-3-cyclooctyl-2-hydroxy-N’-(4-methylphenyl)propanohydrazide

[0757] The desired product was prepared by substituting Example 199A for Example 97A in Example 193.

[0758] MS(ESI) m/e 320 (M+H)+;

[0759] 1H NMR (500 MHz, CD3OD) δ 7.02 (d, 2H), 6.77 (m, 2H), 4.46 (d, 0.35H), 4.38 (d, 0.65H), 3.85 (m, 1H), 3.78 (m, 1H), 2.25 (s, 1.05H), 2.23 (s, 2.95H), 1.80-1.50 (m, 14H).

EXAMPLE 200
(2RS,3S)-3-amino-4-(cyclohexylmethyl)sulfanyl)-2-hydroxy-N’-(4-methylphenyl)butanohydrazide

EXAMPLE 200A
(2S)-2-((tert-butoxycarbonyl)amino)-3-(cyclohexylmethyl)sulfanyl)propanoic acid

[0760] The desired product was prepared by substituting cyclohexylmethyl bromide for 2-bromopropane and D-cysteine for D-homocystine in Example 123A.

EXAMPLE 200B
(2RS,3S)-2-((tert-butoxycarbonyl)amino)-3-(cyclohexylmethyl)sulfanyl)propanoic acid

[0761] The desired product was prepared by substituting Example 200A for (2R)-2-((tert-butoxycarbonyl)amino)-3-cyclohexylpropanoic acid in Examples 1A-C.

EXAMPLE 200C
(2RS,3S)-3-amino-4-(cyclohexylmethyl)sulfanyl)-2-hydroxy-N’-(4-methylphenyl)butanohydrazide

[0762] The desired product was prepared by substituting Example 200B for Example 97A in Example 193.

[0763] MS(ESI) m/e 298 (M+H)+;

[0764] 1H NMR (500 MHz, CD3OD) δ 7.02 (d, 2H), 6.77 (d, 2H), 4.52 (d, 0.65H), 4.50 (d, 0.35H), 3.76 (m, 0.35H), 3.67-3.58 (m, 0.65H), 2.93 (dd, 0.65H), 2.82 (dd, 0.35H), 2.75 (m, 1H), 2.48 (m, 1H), 2.41 (m, 1H), 2.23 (s, 3H), 1.86 (m, 2H), 1.75-1.66 (m, 3H), 1.47 (m, 1H), 1.32-1.15 (m, 3H), 1.00 (m, 2H).

EXAMPLE 201
(2RS,3S)-3-amino-4-(ethylsulfanyl)-2-hydroxy-N’-(1-naphthyl)butanohydrazide

[0765] The desired product was prepared by substituting 1-naphthylhydrazine for 4-methylphenylhydrazine in Example 193.

[0766] MS(ESI) m/e 320 (M+H)+;

[0767] 1H NMR (500 MHz, CD3OD) δ 8.07 (m, 1H), 7.81 (dd, 1H), 7.47 (dd, 2H), 7.39 (dd, 1H), 7.33 (dd, 1H), 6.91 (dd, 1H), 4.62 (d, 0.65H), 4.60 (d, 0.35H), 4.51 (m, 0.35H), 3.71 (m, 1H), 3.00 (dd, 0.5H), 2.81 (m, 1H), 2.65 (dd, 1.3H), 2.60 (dd, 0.7H), 1.30 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 202
(2RS,3R)-3-amino-3-cyclohexyl-2-hydroxy-N’-(1-naphthyl)propanohydrazide

[0768] The desired product was prepared by substituting 1-naphthylhydrazine for 4-methylphenylhydrazine and Example 122A for Example 97A in Example 193.

[0769] MS(ESI) m/e 328 (M+H)+;

[0770] 1H NMR (500 MHz, CD3OD) δ 8.08 (m, 1H), 7.82 (dd, 1H), 7.47 (dd, 2H), 7.39 (d, 1H), 7.33 (m, 1H), 6.91 (dd, 1H), 4.56 (d, 0.65H), 4.53 (d, 0.35H), 3.37 (dd, 1H), 1.99-1.72 (m, 6H), 1.39-1.12 (m, 5H).

EXAMPLE 203
(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)-N’-(1-naphthyl)pentaanoohydrazide

[0771] The desired product was prepared by substituting 1-naphthylhydrazine for 4-methylphenylhydrazine and Example 123B for Example 97A in Example 193.

[0772] MS(ESI) m/e 348 (M+H)+;

[0773] 1H NMR (500 MHz, CD3OD) δ 8.07 (m, 1H), 7.81 (dd, 1H), 7.47 (dd, 2H), 7.39 (m, 1H), 7.34 (m, 1H), 6.90 (dd, 1H), 4.51 (d, 0.35H), 4.46 (d, 0.65H), 3.76 (m, 1H), 2.99 (dd, 0.65H), 2.93 (dd, 0.35H), 2.74 (m, 1.65H), 2.69 (m, 0.35H), 2.17 (dd, 0.65H), 2.05 (dd, 0.35H), 1.95 (dd, 1H), 1.29 (d, 3H), 1.27 (d, 3H).

EXAMPLE 204
(2RS,3S)-3-amino-2-hydroxy-4-(isobutylsulfanyl)-N’-(1-naphthyl)butanohydrazide

[0774] The desired product was prepared by substituting 1-naphthylhydrazine for 4-methylphenylhydrazine and Example 124B for Example 97A in Example 193.

[0775] MS(ESI) m/e 347 (M+H)+;

[0776] 1H NMR (500 MHz, CD3OD) δ 8.06 (m, 1H), 7.82 (dd, 1H), 7.48 (dd, 2H), 7.41 (m, 1H), 7.33 (t, 1H), 6.92 (d, 1H), 4.63 (d, 1H), 3.70 (dd, 1H), 2.99 (dd, 1H), 2.80 (dd, 1H), 2.53 (d, 2H), 1.84 (dd, 1H), 1.03 (d, 6H).

EXAMPLE 205
(2RS,3R)-3-amino-2-hydroxy-5-phenyl-N’-(1-naphthyl)pentaanoohydrazide

[0777] The desired product was prepared by substituting 1-naphthylhydrazine for 4-methylphenylhydrazine and Example 125A for Example 97A in Example 193.

[0778] MS(ESI) m/e 350 (M+H)+;

[0779] 1H NMR (500 MHz, CD3OD) δ 8.06 (m, 1H), 7.80 (m, 1H), 7.46 (m, 2H), 7.37 (m, 1H), 7.31 (dd, 1H), 7.25 (m, 5H), 6.86 (dd, 1H), 4.53 (d, 0.5H), 4.51 (d, 0.5H), 3.65 (m, 0.5H), 3.60 (m, 0.5H), 2.82 (m, 1.5H), 2.72 (m, 0.5H), 2.20 (m, 0.5H), 2.08 (m, 1H), 1.98 (m, 0.5H).

EXAMPLE 206
(2RS,3R)-3-amino-3-cyclooctyl-2-hydroxy-N’-(1-naphthyl)propanohydrazide

[0780] The desired product was prepared by substituting 1-naphthylhydrazine for 4-methylphenylhydrazine and Example 199A for Example 97A in Example 193.
[0781] MS(ESI) m/e 356 (M+H)+;

[0782] 1H NMR (500 MHz, CD3OD) δ 8.08 (m, 1H), 7.84 (m, 1H), 7.49 (m, 2H), 7.41 (m, 1H), 7.32 (t, 1H), 6.97 (dd, 1H), 4.49 (d, 0.5H), 3.99 (d, 0.5H), 3.85 (m, 1H), 1.80-1.52 (m, 15H).

EXAMPLE 207
N’-(2RS,3S)-3-amino-4-(ethylsulfonyl)-2-hydroxybutanoyl)-3-chlorobenzoylhydrazide

[0783] The desired product was prepared by substituting 3-chlorobenzoylhydrazide for 4-methylphenylhydrazine in Example 193.

[0784] MS(ESI) m/e 332 (M+H)+;

[0785] 1H NMR (500 MHz, CD3OD) δ 7.91 (m, 1H), 7.81 (m, 1H), 7.62 (m, 1H), 7.51 (m, 1H), 4.63 (d, 0.65H), 4.58 (d, 0.35H), 3.70 (m, 1H), 3.00 (dd, 1H), 2.84 (m, 1H), 2.66 (dd, 1.3H), 2.62 (dd, 0.7H), 1.31 (t, 1.95H), 1.29 (t, 1.05H).

EXAMPLE 208
N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxypropanoyl)-3-chlorobenzoylhydrazide

[0786] The desired product was prepared by substituting 3-chlorobenzoylhydrazide for 4-methylphenylhydrazine and Example 122A for Example 97A in Example 193.

[0787] MS(ESI) m/e 340 (M+H)+;

[0788] 1H NMR (500 MHz, CD3OD) δ 7.91 (m, 1H), 7.82 (m, 1H), 7.62 (m, 1H), 7.50 (m, 1H), 4.56 (d, 0.65H), 4.52 (d, 0.35H), 3.33 (m, 1H), 1.95 (m, 1H), 1.86 (m, 4H), 1.74 (m, 1H), 1.35 (m, 2H), 1.24 (m, 1H), 1.16 (m, 2H).

EXAMPLE 209
N’-(2RS,3S)-3-amino-4-hydroxy-4-(propylsulfanyl)butanoyl)-3-chlorobenzoylhydrazide

[0789] The desired product was prepared by substituting 3-chlorobenzoylhydrazide for 4-methylphenylhydrazine and Example 195B for Example 97A in Example 193.

[0790] MS(ESI) m/e 346 (M+H)+;

[0791] 1H NMR (500 MHz, CD3OD) δ 7.91 (dd, 1H), 7.81 (dd, 1H), 7.62 (dd, 1H), 7.50 (m, 1H), 4.63 (d, 0.65H), 4.58 (d, 0.35H), 3.70 (m, 1H), 3.17 (dd, 0.35H), 2.98 (dd, 0.65H), 2.84 (dd, 0.65H), 2.80 (dd, 0.35H), 2.60 (m, 2H), 1.66 (m, 2H), 1.63 (t, 1.95H), 1.01 (t, 1.05H).

EXAMPLE 210
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-chlorobenzoylhydrazide

[0792] The desired product was prepared by substituting 3-chlorobenzoylhydrazide for 4-methylphenylhydrazine and Example 123B for Example 97A in Example 193.

[0793] MS(ESI) m/e 360 (M+H)+;

[0794] 1H NMR (500 MHz, CD3OD) δ 7.90 (dd, 1H), 7.81 (m, 1H), 7.62 (m, 1H), 7.50 (m, 1H), 4.49 (d, 0.3H), 4.45 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

EXAMPLE 211
N’-(2RS,3S)-3-amino-2-hydroxy-4-(isobutylsulfanyl)butanoyl)-3-chlorobenzoylhydrazide

[0795] The desired product was prepared by substituting 3-chlorobenzoylhydrazide for 4-methylphenylhydrazine and Example 124B for Example 97A in Example 193.

[0796] MS(ESI) m/e 360 (M+H)+;

[0797] 1H NMR (500 MHz, CD3OD) δ 7.91 (dd, 1H), 7.82 (dd, 1H), 7.63 (dd, 1H), 7.51 (t, 1H), 4.64 (d, 1H), 3.70 (dd, 1H), 2.97 (dd, 1H), 2.83 (dd, 1H), 2.53 (dd, 2H), 1.85 (dd, 1H), 1.04 (d, 6H).

EXAMPLE 212
N’-(2RS,3R)-3-amino-2-hydroxy-5-phenylpentanoyl)-3-chlorobenzoylhydrazide

[0798] The desired product was prepared by substituting 3-chlorobenzoylhydrazide for 4-methylphenylhydrazine and Example 125A for Example 97A in Example 193.

[0799] MS(ESI) m/e 362 (M+H)+;

[0800] 1H NMR (500 MHz, CD3OD) δ 7.91 (m, 1H), 7.81 (dd, 1H), 7.61 (dd, 1H), 7.50 (m, 1H), 7.29 (m, 4H), 7.20 (m, 1H), 4.50 (m, 1H), 3.62 (m, 1H), 2.80 (m, 2H), 2.20 (m, 1H), 2.02 (m, 1H).

EXAMPLE 213
N’-(2RS,3R)-3-amino-3-cyclooctyl-2-hydroxypropanoyl)-3-chlorobenzoylhydrazide

[0801] The desired product was prepared by substituting 3-chlorobenzoylhydrazide for 4-methylphenylhydrazine and Example 199A for Example 97A in Example 193.

[0802] MS(ESI) m/e 368 (M+H)+;

[0803] 1H NMR (500 MHz, CD3OD) δ 7.90 (m, 1H), 7.82 (m, 1H), 7.62 (dd, 1H), 7.50 (t, 1H), 3.95 (d, 1H), 3.82 (t, 1H), 1.81 (m, 4H), 1.68 (m, 4H), 1.55 (m, 7H).

EXAMPLE 214
N’-(2RS,3R)-3-amino-5-cyclohexyl-2-hydroxypentanoyl)-3-chlorobenzoylhydrazide

[0804] The desired product was prepared by substituting 3-chlorobenzoylhydrazide for 4-methylphenylhydrazine and Example 238A for Example 97A in Example 193.

[0805] MS(ESI) m/e 367 (M+H)+;

[0806] 1H NMR (500 MHz, CD3OD) δ 7.89 (dd, 1H), 7.80 (dd, 1H), 7.62 (dd, 1H), 7.50 (t, 1H), 3.90 (m, 1H), 3.78 (d, 1H), 1.81-1.72 (m, 5H), 1.68 (m, 1H), 1.54 (m, 2H), 1.29 (m, 4H), 1.21 (m, 1H), 0.96 (m, 2H).

EXAMPLE 215
(2RS,3R)-3-amino-5-cyclohexyl-2-hydroxy-N’-(4-methylphenyl)pentanoylhydrazide

[0807] The desired product was prepared by substituting 4-methylbenzoylhydrazide for Example 97A in Example 193.

[0808] MS(ESI) m/e 320 (M+H)+;
[0809] 1H NMR (500 MHz, CD$_2$OD) δ 7.07 (d, 0.5H), 7.06 (d, 1.5H), 6.77 (m, 2H), 3.81 (m, 1H), 3.63 (d, 1H), 2.22 (s, 3H), 1.77-1.60 (m, 6H), 1.50 (m, 2H), 1.29-1.17 (m, 6H), 0.97-0.91 (m, 1H).

**EXAMPLE 216**

(2RS,3S)-3-amino-2-hydroxy-N'-(1-naphthyl)-4-(propylsulfanyl)butanoylhydrazide

[0810] The desired product was prepared by substituting 1-naphthylhydrazine for 4-methylphenylhydrazine and Example 195B for Example 97A in Example 193.

[0811] MS(ESI) m/e 334 (M+H)$^+$;

[0812] 1H NMR (500 MHz, CD$_2$OD) δ 8.06 (m, 1H), 7.81 (dd, 1H), 7.47 (dd, 2H), 7.39 (d, 1H), 7.34 (m, 1H), 6.90 (dd, 1H), 6.62 (d, 0.65H), 4.59 (d, 0.35H), 3.71 (m, 1H), 2.99 (dd, 0.65H), 2.92 (dd, 0.35H), 2.81 (m, 1H), 2.60 (dd, 1H), 2.54 (m, 1H), 1.66 (dd, 1H), 1.59 (dd, 1H), 1.02 (t, 1.95H), 0.98 (t, 1.05H).

**EXAMPLE 217**

(2RS,3R)-3-amino-5-cyclohexyl-2-hydroxy-N'-(1-naphthyl)pentanoylhydrazide

[0813] The desired product was prepared by substituting 1-naphthylhydrazine for 4-methylphenylhydrazine and Example 238A for Example 97A in Example 193.

[0814] MS(ESI) m/e 356 (M+H)$^+$;

[0815] 1H NMR (500 MHz, CD$_2$OD) δ 8.06 (m, 1H), 7.81 (m, 1H), 7.47 (m, 2H), 7.41 (m, 1H), 7.31 (t, 1H), 6.95 (dd, 1H), 3.91 (m, 1H), 3.78 (d, 1H), 1.74 (m, 5H), 1.55 (m, 2H), 1.28 (m, 4H), 1.20 (m, 2H), 0.97 (m, 2H).

**EXAMPLE 218**

(2RS,3S)-3-amino-4-((cyclohexylmethyl)sulfanyl)-2-hydroxy-N'-(1-naphthyl)butanoylhydrazide

[0816] The desired product was prepared by substituting 1-naphthylhydrazine for 4-methylphenylhydrazine and Example 200A for Example 97A in Example 193.

[0817] MS(ESI) m/e 388 (M+H)$^+$;

[0818] 1H NMR (500 MHz, CD$_2$OD) δ 8.06 (m, 1H), 7.81 (dd, 1H), 7.47 (dd, 2H), 7.39 (d, 1H), 7.32 (m, 1H), 6.90 (dd, 1H), 6.62 (d, 0.65H), 4.58 (d, 0.35H), 3.68 (m, 1H), 2.96 (dd, 1H), 2.83 (dd, 0.35H), 2.77 (dd, 0.65H), 2.51 (dd, 1.5H), 2.44 (d, 0.5H), 1.88 (m, 2H), 1.75-1.66 (m, 3H), 1.50 (m, 1H), 1.22, (m, 3H), 0.98 (m, 2H).

**EXAMPLE 219**

N'-(2RS,3S)-3-amino-4-((cyclohexylmethyl)sulfanyl)-2-hydroxybutanoyl-3-chlorobenzoylhydrazide

[0819] The desired product was prepared by substituting 3-chlorobenzoylhydrazide for 4-methylphenylhydrazine and Example 205B for Example 97A in Example 193.

[0820] MS(ESI) m/e 401 (M+H)$^+$;

[0821] 1H NMR (500 MHz, CD$_2$OD) δ 7.91 (m, 1H), 7.81 (dd, 1H), 7.61 (dd, 1H), 7.50 (t, 1H), 4.63 (d, 0.65H), 4.56 (d, 0.35H), 3.68 (m, 1H), 2.95 (dd, 1H), 2.81 (dd, 1H), 2.78 (dd, 0.35H), 2.52 (d, 1H), 2.46 (m, 0.65H), 1.88 (m, 2H), 1.76-1.64 (m, 3H), 1.51 (m, 1H), 1.32-1.16 (m, 3H), 0.99 (m, 2H).

**EXAMPLE 220**

(2RS,3R)-3-amino-2-hydroxy-5-phenyl-N'-(1-naphthyl)pentanoylhydrazide

[0822] The desired product was prepared by substituting 2-naphthoylhydrazine for O-phenyl hydroxylamine hydrochloride and Example 125A for Example 98A in Example 98B.

[0823] MS(ESI) m/e 378 (M+H)$^+$;

[0824] 1H NMR (300 MHz, DMSO-d$_6$) δ 10.73 (s, 1H), 10.32 (br s, 1H), 8.52 (s, 1H), 8.04 (m, 6H), 7.65 (m, 2H), 7.30 (m, 5H), 6.69 (m, 1H), 4.32 (m, 1H), 2.74 (m, 2H), 2.06 (m, 1H), 1.89 (m, 1H).

**EXAMPLE 221**

N'-(2RS,3R)-3-amino-3-cyclohexyl-2-hydroxypropanoyl)-2-naphthoylhydrazide

[0825] The desired product was prepared by substituting 2-naphthoylhydrazine for o-phenyl hydroxylamine hydrochloride and Example 122A for Example 98A in Example 98B.

[0826] MS(ESI) m/e 356 (M+H)$^+$;

[0827] 1H NMR (300 MHz, DMSO-d$_6$) δ 10.60 (s, 1H), 10.29 (s, 1H), 8.51 (s, 1H), 8.07 (m, 4H), 7.80 (br s, 2H), 7.64 (m, 2H), 6.54 (m, 1H), 4.41 (m, 1H), 1.77-1.44 (m, 6H), 1.20-0.94 (m, 5H).

**EXAMPLE 222**

N'-(2RS,3R)-3-amino-2-hydroxy-5-isopropylsulfanylpentanoyl)-2-naphthoylhydrazide

[0828] The desired product was prepared by substituting 2-naphthoylhydrazine for O-phenyl hydroxylamine hydrochloride and Example 123B for Example 98A in Example 98B.

[0829] MS(ESI) m/e 376 (M+H)$^+$;

[0830] 1H NMR (300 MHz, DMSO-d$_6$) δ 10.56 (br s, 0.7H), 10.47 (br s, 0.3H), 9.90 (br s, 0.3H), 9.83 (br s, 0.7H), 8.75 (s, 0.3H), 8.51 (s, 0.7H), 8.00 (m, 3H), 7.63 (m, 2H), 7.38 (m, 1H), 7.22 (m, 1H), 6.89 (m, 1H), 6.18 (m, 1H), 4.21 (m, 0.7H), 4.13 (m, 0.3H), 2.96 (m, 1H), 2.70 (m, 1H), 2.62 (m, 1H), 1.91 (m, 1H), 1.73 (m, 1H), 1.21 (d, 6H).

**EXAMPLE 223**

N'-(2RS,3S)-3-amino-2-hydroxy-4-(isobutylsulfanyl)butanoyl)-2-naphthoylhydrazide

[0831] The desired product was prepared by substituting 2-naphthoylhydrazine for o-phenyl hydroxylamine hydrochloride and Example 124B for Example 98A in Example 98B.

[0832] MS(ESI) m/e 376 (M+H)$^+$;
EXAMPLE 224
N'-(2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-chlorobenzohydrazide

[0833] \(^1\)H NMR (300 MHz, DMSO-d\(_6\)) \(\delta\) 8.52 (s, 1H), 8.04 (m, 6H), 7.65 (m, 2H), 6.74 (m, 1H), 4.40 (m, 1H), 2.94 (dd, 1H), 2.72 (dd, 1H), 2.48 (d, 2H), 1.80 (m, 1H), 0.98 (d, 6H).

EXAMPLE 224A
N'-(2S,3R)-3-(tet-butoxycarbonyl)amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-chlorobenzohydrazide

[0834] A solution of Example 123B (0.20 g, 0.65 mmol), 3-chlorobenzoyl hydrazine (0.17 g, 1.0 mmol), 1-(3-dimethylaminomethyl)-3-ethylcarboxylidemide hydrochloride (0.13 g, 0.68 mmol), 1-hydroxybenzotriazole (0.11 g, 0.81 mmol), and N-methylmorpholine (0.070 mL, 0.64 mmol) in dichloromethane (6 mL) at room temperature was stirred for 16 hours, diluted with dichloromethane, washed sequentially with aqueous NaHCO\(_3\), brine, 10% KHSO\(_4\), and brine, dried (MgSO\(_4\)), filtered, and concentrated. The concentrate was purified by HPLC on silica gel with 4:1:hexanes:acetone to provide the desired product.

[0835] MS(ESI) m/z 460 (M+H)+.

EXAMPLE 224B
N'-(2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-chlorobenzohydrazide

[0836] The desired product was prepared by substituting Example 224A for Example 118A in Example 118B.

[0837] MS(ESI) m/z 360 (M+H)+.

[0838] \(^1\)H NMR (300 MHz, DMSO-d\(_6\)) \(\delta\) 11.60 (br s, 1H), 10.30 (br s, 1H), 8.01 (br s, 2H), 7.92 (m, 1H), 7.85 (d, 1H), 7.69 (m, 1H), 7.57 (t, 1H), 6.67 (d, 1H), 4.26 (m, 1H), 2.97 (m, 1H), 2.70 (m, 1H), 2.62 (m, 1H), 1.97 (m, 1H), 1.85 (m, 1H), 1.21 (d, 6H).

EXAMPLE 225
N'-(2S,3R)-3-amino-2-hydroxy-5-(ethylsulfanyl)-pentanoyl)-3-chlorobenzohydrazide

[0839] The desired product was prepared by substituting Example 98A for Example 123B in Example 224A.

[0840] MS(ESI) m/z 446 (M+H)+.

EXAMPLE 225B
N'-(2S,3R)-3-amino-2-hydroxy-5-(ethylsulfanyl)pentanoyl)-3-chlorobenzohydrazide

[0841] The desired product was prepared by substituting Example 225A for Example 118A in Example 118B.

[0842] MS(ESI) m/z 346 (M+H)+.

[0843] \(^1\)H NMR (300 MHz, DMSO-d\(_6\)) \(\delta\) 10.06 (br s, 1H), 10.29 (br s, 1H), 7.99 (br s, 2H), 7.91 (m, 1H), 7.84 (m, 1H), 7.69 (m, 1H), 7.57 (t, 1H), 6.67 (d, 1H), 4.25 (m, 1H), 3.40 (m, 1H), 2.67 (m, 2H), 2.50 (m, 2H), 1.99 (m, 1H), 1.85 (m, 1H), 1.19 (t, 3H).

EXAMPLE 226
N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-1-naphthohydrazide

[0844] The desired product was prepared by substituting 1-naphthohydrazide for 0-phenyl hydroxylamine hydrochloride and Example 1C for Example 98A in Example 98B.

[0845] MS(ESI) m/z 370 (M+H)+.

[0846] \(^1\)H NMR (300 MHz, DMSO-d\(_6\)) \(\delta\) 10.53 (br s, 1H), 10.34 (br s, 1H), 8.84 (dd, 1H), 8.08 (d, 1H), 8.01 (m, 1H), 7.85 (br s, 2H), 7.66 (m, 1H), 7.59 (m, 3H), 6.61 (d, 1H), 4.20 (m, 1H), 1.74-1.60 (m, 6H), 1.50-1.40 (m, 1H), 1.33-1.15 (m, 4H), 0.96-0.80 (m, 2H).

EXAMPLE 227
N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-hydroxy-2-naphthohydrazide

[0847] The desired product was prepared by substituting 3-hydroxy-2-naphthohydrazide for 0-phenyl hydroxylamine hydrochloride and Example 1C for Example 98A in Example 98B.

[0848] MS(ESI) m/z 386 (M+H)+.

[0849] \(^1\)H NMR (300 MHz, DMSO-d\(_6\)) \(\delta\) 11.44 (br s, 1H), 10.70 (br s, 1H), 10.58 (br s, 1H), 8.52 (s, 1H), 7.93 (d, 1H), 7.79 (m, 3H), 7.53 (t, 1H), 7.38 (d, 1H), 7.43 (s, 1H), 6.61 (d, 1H), 4.22 (m, 1H), 1.74-1.60 (m, 6H), 1.50-1.40 (m, 1H), 1.33-1.15 (m, 4H), 0.96-0.80 (m, 2H).

EXAMPLE 228
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-pentanoyl)-1-naphthohydrazide

[0850] The desired product was prepared by substituting 1-naphthohydrazide for O-phenyl hydroxylamine hydrochloride in Example 98B.

[0851] MS(ESI) m/z 362 (M+H)+.

[0852] \(^1\)H NMR (300 MHz, DMSO-d\(_6\)) \(\delta\) 10.54 (br s, 1H), 10.37 (br s, 1H), 8.34 (br s, 1H), 8.01 (m, 3H), 7.59 (m, 4H), 6.68 (d, 0.7H), 6.60 (d, 0.3H), 4.40 (m, 0.3H), 4.26 (m, 0.7H), 3.39 (m, 1H), 2.70 (m, 2H), 2.54 (m, 2H), 2.06 (m, 1H), 1.87 (m, 1H), 1.19 (t, 3H).

EXAMPLE 229
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-pentanoyl)-3-hydroxy-2-naphthohydrazide

[0853] The desired product was prepared by substituting 3-hydroxy-2-naphthohydrazide for O-phenyl hydroxylamine hydrochloride in Example 98B.

[0854] MS(ESI) m/z 378 (M+H)+.
[0855] 1H NMR (300 MHz, DMSO-d6) δ 11.45 (br s, 1H), 10.69 (br s, 1H), 10.58 (br s, 1H), 8.52 (br s, 1H), 8.03 (br s, 2H), 7.90 (m, 2H), 7.77 (m, 1H), 7.53 (t, 1H), 7.38 (d, 1H), 7.33 (m, 1H), 6.68 (d, 0.6H), 6.62 (d, 0.4H), 4.40 (m, 0.4H), 4.29 (m, 0.6H), 3.39 (m, 1H), 2.66 (m, 2H), 2.54 (m, 2H), 1.97 (m, 1H), 1.87 (m, 1H), 1.20 (t, 3H).

EXAMPLE 230
N’-(2S,3R)-3-amino-2-hydroxy-5-phenylpentanoyl)-1-naphthohydrazide

[0856] The desired product was prepared by substituting 1-naphthohydrazide for O-phenyl hydroxylamine hydrochloride and Example 125A for Example 98A in Example 98B.

[0857] MS(ESI) m/z 378 (M+H)+.

[0858] 1H NMR (300 MHz, DMSO-d6) δ 10.54 (br s, 1H), 10.38 (br s, 1H), 8.35 (m, 1H), 8.08 (m, 1H), 8.00 (br s, 2H), 7.59 (m, 4H), 7.29 (m, 5H), 7.18 (m, 1H), 6.68 (m, 1H), 4.31 (m, 1H), 2.74 (m, 2H), 2.06 (m, 1H), 1.89 (m, 1H).

EXAMPLE 231
N’-(2S,3R)-3-amino-2-hydroxy-5-phenylpentanoyl)-1-hydroxynaphthohydrazide

[0859] The desired product was prepared by substituting 3-hydroxy-2-naphthohydrazide for O-phenyl hydroxylamine hydrochloride and Example 125A for Example 98A in Example 98B.

[0860] MS(ESI) m/z 394 (M+H)+.

[0861] 1H NMR (300 MHz, DMSO-d6) δ 11.43 (br s, 1H), 10.70 (br s, 1H), 10.58 (br s, 1H), 8.52 (s, 1H), 7.94 (m, 3H), 7.77 (d, 1H), 7.53 (t, 1H), 7.30 (m, 7H), 6.69 (d, 1H), 4.35 (m, 1H), 2.72 (m, 2H), 1.99 (m, 1H), 1.91 (m, 1H).

EXAMPLE 232
(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoylhydrazide

EXAMPLE 232A
(2S,3R)-3-((tert-butoxycarbonylamino)-4-cyclohexyl-2-hydroxybutanoic acid pentfluorophenyl ester

[0862] The title compound was prepared by substituting Example 1C for Example 124A in Example 126B.

[0863] MS(ESI) m/z 466 (M+H)+.

EXAMPLE 232B
(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoylhydrazide

EXAMPLE 232C
The title compound was prepared by substituting Example 232A for Example 126B and anhydrous hydrazine for Example 126A in Example 126C.

[0865] MS(ESI) m/z 216 (M+H)+.

[0866] 1H NMR (300 MHz, DMSO-d6) δ 11.05 (br s, 1H), 7.97 (br s, 2H), 6.75 (br s, 1H), 4.22 (d, 2H), 1.74-1.60 (m, 6H), 1.42 (d, 2H), 1.28-1.10 (m, 3H), 0.92-0.74 (m, 2H).

EXAMPLE 233
N’-(2R,3R)-3-amino-2-hydroxy-5-(ethylsulfanyl)-pentanoyl)-3-chlorobenzoyl hydrazide

EXAMPLE 233A
N’-(2R,3R)-3-(tert-butoxycarbonylaminocarbonyl)-2-hydroxy-5-(ethylsulfanyl)pentanoyl)-3-chlorobenzoyl hydrazide

[0867] The desired product was prepared by substituting Example 98A for Example 123B in Example 224A.

[0868] MS(ESI) m/z 446 (M+H)+.

EXAMPLE 233B
N’-(2R,3R)-3-amino-2-hydroxy-5-(ethylsulfanyl)pentanoyl)-3-chlorobenzoyl hydrazide

[0869] The desired product was prepared by substituting Example 233A for Example 118A in Example 118B.

[0870] MS(ESI) m/z 346 (M+H)+.

[0871] 1H NMR (300 MHz, DMSO-d6) δ 10.52 (br s, 1H), 10.20 (br s, 1H), 8.07 (br s, 2H), 7.90 (m, 1H), 7.83 (m, 1H), 7.67 (m, 1H), 7.56 (t, 1H), 6.60 (d, 1H), 4.39 (m, 1H), 3.57 (m, 1H), 2.69 (m, 2H), 2.53 (m, 2H), 1.95 (m, 1H), 1.86 (m, 1H), 1.18 (t, 3H).

EXAMPLE 234
N’-(2R,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-chlorobenzoyl hydrazide

EXAMPLE 234A
N’-(2R,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-chlorobenzoyl hydrazide

[0872] The desired product was prepared as described in Example 224A.

[0873] MS(ESI) m/z 460 (M+H)+.

EXAMPLE 234B
N’-(2R,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-chlorobenzoyl hydrazide

[0874] The desired product was prepared by substituting Example 234A for Example 118A in Example 118B.

[0875] MS(ESI) m/z 360 (M+H)+.

[0876] 1H NMR (300 MHz, DMSO-d6) δ 10.52 (br s, 1H), 10.18 (br s, 1H), 8.11 (br s, 2H), 7.90 (m, 1H), 7.84 (d, 1H), 7.64 (m, 1H), 7.56 (t, 1H), 6.59 (d, 1H), 4.42 (m, 1H), 2.97 (m, 1H), 2.69 (m, 1H), 2.62 (m, 2H), 1.89 (m, 2H), 1.20 (d, 6H).

EXAMPLE 235
3-[(2-aminoethyl)-N’-(2S,3S)-3-amino-2-hydroxy-4-(isobutylsulfanyl)butanoyl]benzohydrazide

EXAMPLE 235A
methyl 3-(cyanomethyl)benzoate

[0877] A solution of methyl 3-(bromomethyl)benzoate (2.29 g, 0.01 mol) and potassium cyanide (3.26 g, 0.05 mol)
in DMSO (20 mL) was heated to 100°C for 1 h. The reaction mixture was cooled, partitioned between ether and water, washed with brine, dried (Na₂SO₄) and concentrated to give the title compound.

**Example 235**

3-(2-(tert-butoxycarbonylamino)ethyl)benzoyl hydrazide

A solution of Example 235A (1.23 g, 7 mmol) in methanol (15 mL) was hydrogenated in the presence of RanNi (2.5 g) for 18 h. After filtration and evaporation of the solvent, the resulting oil (0.1 g, 0.6 mmol) was dissolved in dichloromethane (5 mL), treated with di-tert-butyl dicarbonate (0.13 g, 0.6 mmol) for 16 h at room temperature. The solvent was evaporated and the residue treated with hydrazine hydrate (0.2 g, 6.0 mmol) in ethanol at reflux for 48 h. After the solvent was evaporated, and the residue purified by silica gel chromatography (10/90 methyl/ dichloromethane) to give the title compound.

**Example 235C**

3-(2-aminoethyl)-N’-(2S,3S)-3-amino-2-hydroxy-4- (isobutylsulfonyl)butanoyl)benzoylhydrazide

The title compound was prepared by substituting Example 235B for Example 126A in Example 126C.

**Example 236**

A solution of tert-butylcarbamate (2.85 g, 24 mmol), tert-butylhypochlorite (2.7 mL, 24 mmol) and 0.5 M NaOH (50 mL, 25 mmol) in 1-propanol (75 mL) at room temperature was stirred for 15 minutes. Example 236A (1.70 g, 8.6 mmol), potassium osmate dihydrate (0.27 g, 0.73 mmol) and hydroquinidine 1,4-phthalazinedicarbocyanine (0.62 g, 0.80 mmol) were added, and the mixture stirred in an ice bath for 2 hours, diluted with ethyl acetate, washed sequentially with water, 1 M HCl, aqueous NaHCO₃, and brine, dried (MgSO₄), filtered, and concentrated. The concentrate was purified by flash column chromatography on silica gel with 1/4:ethyl acetate:hexanes to provide the desired product.

**Example 236C**

A solution of Example 236B (0.168 g, 0.51 mmol), 30% hydrogen peroxide (0.25 mL, 2.2 mmol), and lithium hydroxide monohydrate (0.042 g, 1.0 mmol) in 3:1 tetrahydrofuran/water (7 mL) was stirred in an ice bath for 3 hours, then concentrated. The residues were taken up in water and the pH adjusted to 10 with NaOH. The solution was washed twice with ether, adjusted to pH 2 with HCl, then extracted twice with ethyl acetate. The ethyl acetate extracts were dried (MgSO₄), filtered, then concentrated to provide the desired product.

**Example 236D**

A solution of Example 236C (0.111 g, 0.24 mmol) in 1-propanol (75 mL) was refluxed for 15 minutes. Example 236D (0.168 g, 0.51 mmol), potassium osmate dihydrate (0.27 g, 0.73 mmol) and hydroquinidine 1,4-phthalazinedicarbocyanine (0.62 g, 0.80 mmol) were added, and the mixture stirred in an ice bath for 2 hours, diluted with ethyl acetate, washed sequentially with water, 1 M HCl, aqueous NaHCO₃, and brine, dried (MgSO₄), filtered, and concentrated. The concentrate was purified by flash column chromatography on silica gel with 1/4:ethyl acetate:hexanes to provide the desired product.

**Example 236A**

Ethyl 4-ethyl-oct-2-enoate

**Example 237**

A solution of 2-ethyl-hexanol (5.0 g, 39 mmol), triethyl phosphonoacetate (8.0 mL, 40 mmol), lithium bromide (3.6 g, 42 mmol), and triethylamine (5.6 mL, 40 mmol) in tetrahydrofuran (160 mL) at room temperature was stirred for 16 hours, quenched with water, stirred for 15 minutes, diluted with ethyl acetate, washed sequentially with pH buffer and brine, dried (MgSO₄), filtered, and concentrated. The concentrate was purified by flash column chromatography on silica gel with 1:1:chloroform/methanol/hexanes to provide the desired product.

**Example 237B**

Ethyl (2S,3R,4RS)-3-(tert-butoxycarbonylamino)-4-ethyl-hydroxyoctanoate

**Example 237C**

The title compound was prepared by substituting 1-bromopropane for Example 364A in Example 364B.

**Example 237D**

A solution of Example 237E (0.168 g, 0.51 mmol), and lithium hydroxide monohydrate (0.042 g, 1.0 mmol) in 3:1 tetrahydrofuran/water (7 mL) was stirred in an ice bath for 3 hours, then concentrated. The residues were taken up in water and the pH adjusted to 10 with NaOH. The solution was washed twice with ether, adjusted to pH 2 with HCl, then extracted twice with ethyl acetate. The ethyl acetate extracts were dried (MgSO₄), filtered, then concentrated to provide the desired product.

**Example 237A**

Methyl 3-propoxybenzoate

**Example 237B**

Methyl 3-propoxybenzoate
EXAMPEL 238

N-((2S,3R)-3-amino-5-cyclohexyl-2-hydroxypentanoyl)-3-chlorobenzoylhydrazide

EXAMPEL 238A

(2S 3R)-3-( tert-butoxycarbonyl)amino-5-cyclohexyl-2-hydroxypentanoic acid

[0898] The desired product was prepared by substituting 3-cyclohexylpropanal for 2-ethylhexanal in Examples 236A-236C.

[0899] MS(ESI) m/e 316 (M+H)⁺.

EXAMPEL 238B

N-((2S,3R)-3-amino-5-cyclohexyl-2-hydroxypentanoyl)-3-chlorobenzohydrazide

[0900] The desired product was prepared by substituting 3-chlorobenzoylhydrazide for O-phenyl hydroxylamine hydrochloride and Example 238A for Example 98A in Example 98B.

[0901] MS(ESI) m/e 368 (M+H)⁺;

[0902] 1H NMR (300 MHz, DMSO-d6) δ 10.67 (br s, 1H), 10.27 (br s, 1H), 7.91 (m, 1H), 7.85 (m, 3H), 7.69 (d, 1H), 7.57 (t, 1H), 6.58 (m, 1H), 4.18 (m, 1H), 1.80-1.50 (m, 7H), 1.35-1.10 (m, 6H), 0.89 (m, 2H).

EXAMPEL 239

N-((2RS,3R)-3-amino-5-(ethylsulfonyl))-2-hydroxypentanoyl)-3-trifluoromethylsulfanylbenzohydrazide

EXAMPEL 239A

N-((2RS,3R)-3- (tert-butoxycarbonyl)amino-5-(ethyllysulfonyl))-2-hydroxypentanoyl)hydrazide

[0903] To a solution of Example 97A (2.00 g, 6.5 mmol) in acetonitrile (120 mL) was added HOAc (0.443 g, 3.3 mmol) and the mixture stirred for 5 min until homogeneous. To this solution was added DCC (2.00 g, 9.75 mmol) in acetonitrile (20 mL) and the mixture was stirred for 2 minutes. Hydrazine monohydrate (0.306 mL, 9.76 mmol) was added and the reaction stirred for 16 hours. The solvent was removed in vacuo and the crude material filtered, the solid washed with dichloromethane, and the resulting oil was purified by column chromatography using ethyl acetate to give the desired product 1.2 g (60%).

EXAMPEL 239B

N-((2RS,3R)-3-amino-5-(ethylsulfonyl))-2-hydroxypentanoyl)-3-trifluoromethylsulfanylbenzohydrazide

[0904] To DCC resin (148 mg, 0.225 mmol) in dimethylacetamide/dichloromethane (1:6), and 0.5 mL of a 0.3 M solution of 3-(ethylsulfanyl)benzoic acid (0.15 mmol) in dimethylacetamide. After 5 minutes, 1.0 mL of a 0.225 M solution of Example 239A (0.225 mmol) in dimethylacetamide/dichloromethane (1:1) was added. The mixture was agitated for 18 hours and quenched with 0.19 g of trisamine resin (0.75 mmol) followed by 0.13 g of isocyanate resin (0.225 mmol) and agitated for 4 hours. The mixture was filtered and the resins washed with 1×3 mL of dichloromethane, the solvent was removed in vacuo, and the crude material purified by reverse phase preparative HPLC. The resulting material was treated with 1 mL of 50% trifluoroacetic acid/dichloromethane and agitated at ambient temperature for 18 hours. The solvent was removed in vacuo to give the desired product.

[0905] MS(ESI) m/e 412 (M+H)⁺;

[0906] 1H NMR (500 MHz, CD3OD) δ 8.22 (d, 1H), 8.07 (dd, 1H), 7.93 (t, 1H), 7.65 (m, 1H), 4.49 (d, 0.35), 4.45 (d, 0.65), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (dd, 1H), 1.99 (dt, 1H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPEL 240

N-((2RS,3R)-3-amino-5-(ethylsulfonyl))-2-hydroxypentanoyl)-2-methylbenzohydrazide

[0907] The desired product was prepared by substituting 2-methylbenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[0908] MS(ESI) m/e 326 (M+H)⁺;

[0909] 1H NMR (500 MHz, CD3OD) δ 7.49 (m, 1H), 7.40 (dd, 1H), 7.28 (m, 2H), 4.48 (d, 0.35), 4.44 (d, 0.65), 3.80 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.47 (t, 1.95H), 2.46 (s, 1.05H), 2.17 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.24 (t, 1.05H).

EXAMPEL 241

N-((2RS,3R)-3-amino-5-(ethylsulfonyl))-2-hydroxypentanoyl)-3-methylbenzohydrazide

[0910] The desired product was prepared by substituting 3-methylbenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[0911] MS(ESI) m/e 326 (M+H)⁺;

[0912] 1H NMR (500 MHz, CD3OD) δ 7.72 (d, 1H), 7.67 (dd, 1H), 7.42 (t, 1H), 7.38 (m, 1H), 4.48 (d, 0.35), 4.43 (d, 0.65), 3.77 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.41 (s, 3H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPEL 242

N-((2RS,3R)-3-amino-5-(ethylsulfonyl))-4-methylbenzohydrazide

[0913] The desired product was prepared by substituting 4-methylbenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[0914] MS(ESI) m/e 326 (M+H)⁺;

[0915] 1H NMR (500 MHz, CD3OD) δ 7.79 (m, 2H), 7.32 (m, 2H), 4.48 (d, 0.35), 4.44 (d, 0.65), 3.78 (m, 1H), 2.71 (t,
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-aminobenzohydrozide

**EXAMPLE 243**

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-aminobenzohydrozide

**[0916]** The desired product was prepared by substituting 2-aminobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

**[0917]** MS(ESI) m/e 327 (M+H)+;

**[0918]** 1H NMR (500 MHz, CD3OD) δ 7.56 (dd, 1H), 7.24 (m, 1H), 6.78 (d, 1H), 6.65 (ddd, 1H), 4.48 (d, 0.35), 4.44 (d, 0.65), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (dd, 1H), 2.00 (dt, 1H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

**EXAMPLE 244**

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy pentanoyl)-3-aminobenzohydrozide

**[0919]** The desired product was prepared by substituting 3-aminobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

**[0920]** MS(ESI) m/e 327 (M+H)+;

**[0921]** 1H NMR (500 MHz, CD3OD) δ 7.62 (m, 3H), 6.99 (m, 1H), 4.48 (d, 0.35), 4.43 (d, 0.65), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

**EXAMPLE 245**

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy pentanoyl)-4-aminobenzohydrozide

**[0922]** The desired product was prepared by substituting 3-aminobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

**[0923]** MS(ESI) m/e 327 (M+H)+;

**[0924]** 1H NMR (500 MHz, CD3OD) δ 7.66 (dd, 2H), 6.67 (dd, 2H), 4.46 (d, 0.35), 4.42 (d, 0.65), 3.76 (m, 1H), 2.70 (t, 2H), 2.61 (dd, 2H), 2.15 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

**EXAMPLE 246**

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy pentanoyl)-2-hydroxybenzohydrozide

**[0925]** The desired product was prepared by substituting 2-hydroxybenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

**[0926]** MS(ESI) m/e 328 (M+H)+;

**[0927]** 1H NMR (500 MHz, CD3OD) δ 7.86 (ddd, 1H), 7.44 (m, 1H), 6.96 (m, 2H), 4.49 (d, 0.35), 4.44 (d, 0.65), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

**EXAMPLE 247**

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy pentanoyl)-3-hydroxybenzohydrozide

**[0928]** The desired product was prepared by substituting 3-hydroxybenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

**[0929]** MS(ESI) m/e 328 (M+H)+;

**[0930]** 1H NMR (500 MHz, CD3OD) δ 7.30 (m, 3H), 7.00 (ddd, 1H), 4.46 (d, 0.35), 4.42 (d, 0.65), 3.75 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.15 (dd, 1H), 1.98 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

**EXAMPLE 248**

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy pentanoyl)-4-hydroxybenzohydrozide

**[0931]** The desired product was prepared by substituting 4-hydroxybenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

**[0932]** MS(ESI) m/e 328 (M+H)+;

**[0933]** 1H NMR (500 MHz, CD3OD) δ 7.77 (m, 2H), 6.85 (m, 2H), 4.47 (d, 0.35), 4.43 (d, 0.65), 3.77 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

**EXAMPLE 249**

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy pentanoyl)-3-methoxybenzohydrozide

**[0934]** The desired product was prepared by substituting 3-methoxybenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

**[0935]** MS(ESI) m/e 342 (M+H)+;

**[0936]** 1H NMR (500 MHz, CD3OD) δ 7.44 (m, 3H), 7.16 (ddd, 1H), 4.49 (d, 0.35), 4.44 (d, 0.65), 3.85 (s, 3H), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (dd, 1H), 2.00 (dt, 1H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

**EXAMPLE 250**

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy pentanoyl)-4-methoxybenzohydrozide

**[0937]** The desired product was prepared by substituting 4-methoxybenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

**[0938]** MS(ESI) m/e 342 (M+H)+;

**[0939]** 1H NMR (500 MHz, CD3OD) δ 7.87 (m, 2H), 7.02 (m, 2H), 4.47 (d, 0.35), 4.43 (d, 0.65), 3.87 (s, 3H), 3.76 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.15 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

**EXAMPLE 251**

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy pentanoyl)-2-fluorobenzohydrozide

**[0940]** The desired product was prepared by substituting 2-fluorobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

**[0941]** MS(ESI) m/e 330 (M+H)+;

**[0942]** 1H NMR (500 MHz, CD3OD) δ 7.82 (m, 1H), 7.60 (m, 1H), 7.73 (t, 1H), 7.26 (m, 1B), 4.48 (d, 0.35), 4.44 (d, 0.65), 3.79 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1B), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).
EXAMPLE 252

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-pentanoyl)-3-fluorobenzoazide

[0943] The desired product was prepared by substituting 3-fluorobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[0944] MS(ESI) m/e 330 (M+H)+

[0945] 'H NMR (500 MHz, CD3OD) δ 7.41 (dd, 1H), 7.15 (s, 1H), 7.11 (d, 1H), 6.81 (d, 1H), 4.49 (d, 0.65), 4.33 (d, 1H), 2.81 (t, 2H), 2.71 (t, 2H), 2.39 (t, 1H), 2.00 (s, 1H), 1.37 (s, 1H), 0.87 (s, 1H), 0.68 (s, 1H).

EXAMPLE 253

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-pentanoyl)-4-fluorobenzoazide

[0946] The desired product was prepared by substituting 4-fluorobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[0947] MS(ESI) m/e 330 (M+H)+

[0948] 'H NMR (500 MHz, CD3OD) δ 7.55 (dd, 1H), 7.52 (s, 1H), 7.24 (d, 1H), 4.49 (d, 0.65), 4.44 (d, 1H), 2.71 (t, 2H), 2.55 (dd, 1H), 2.17 (dd, 1H), 2.00 (d, 1H), 1.27 (s, 1H), 1.05 (s, 1H).

EXAMPLE 254

(2RS,3R)-N'-acetyl-3-amino-5-(ethylsulfanyl)-2-hydroxy-pentanoyl)-3-fluorobenzoazide

[0949] The desired product was prepared by substituting acetoxoyl acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[0950] MS(ESI) m/e 326 (M+H)+

[0951] 'H NMR (500 MHz, CD3OD) δ 4.41 (d, 0.35), 4.37 (d, 0.65), 3.72 (m, 1H), 2.81 (d, 1H), 2.58 (dd, 1H), 2.55 (dd, 1H), 2.10 (m, 1H), 2.03 (s, 1H), 1.95 (m, 1H), 1.23-1.31 (m, 3H).

EXAMPLE 255

(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-isobutylpentanoyl)-3-fluorobenzoazide

[0952] The desired product was prepared by substituting 2-methylpropionic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[0953] MS(ESI) m/e 278 (M+H)+

[0954] 'H NMR (500 MHz, CD3OD) δ 4.41 (d, 0.35), 3.73 (m, 1H), 2.67-2.88 (m, 5H), 2.41 (s, 1H), 2.03 (t, 1H), 1.95 (s, 1H), 1.23 (t, 1.05H), 1.25 (m, 6H).

EXAMPLE 256

(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'- (methylbutanoyl)pentanoyl)-3-fluorobenzoazide

[0955] The desired product was prepared by substituting 3-methylbutyric acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[0956] MS(ESI) m/e 292 (M+H)+

[0957] 'H NMR (500 MHz, CD3OD) δ 4.41 (d, 0.35), 4.37 (d, 0.65), 3.73 (m, 1H), 2.57 (dd, 1H), 2.59 (dd, 1H), 2.55 (dd, 1.07H), 2.07-2.16 (m, 4H), 1.95 (dt, 1H), 1.26 (t, 1.95H), 1.24 (t, 1.05H), 1.10 (t, 6H).

EXAMPLE 257

(2RS,3R)-3-amino-5-(ethylsulfanyl)-N'-heptanoyl-2-hydroxy-pentanoyl)-3-fluorobenzoazide

[0958] The desired product was prepared by substituting heptanoyl acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[0959] MS(ESI) m/e 320 (M+H)+

[0960] 'H NMR (500 MHz, CD3OD) δ 4.41 (d, 0.35), 4.37 (d, 0.65), 3.73 (m, 1H), 2.67 (dd, 2H), 2.59 (dd, 1H), 2.55 (dd, 0.78H), 2.28 (dd, 2H), 2.12 (dd, 1H), 1.95 (dt, 1H), 1.64 (dd, 2H), 1.31-1.40 (m, 6H), 1.26 (t, 1.95H), 1.24 (t, 1.05H), 0.91 (t, 3H).

EXAMPLE 258

(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N' -tetrahydro-2-furanylcarbonylpentanoyl)-3-fluorobenzoazide

[0961] The desired product was prepared by substituting 2-tetrahydrofuranoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[0962] MS(ESI) m/e 306 (M+H)+

[0963] 'H NMR (500 MHz, CD3OD) δ 4.48-4.41 (m, 1.35), 4.37 (d, 0.65), 4.01 (m, 1H), 3.88 (m, 1H), 3.73 (m, 1H), 2.67 (dd, 2H), 2.59 (dd, 1H), 2.55 (dd, 0.78H), 2.29 (m, 1H), 2.08 (m, 2H), 1.96 (m, 3H), 1.26 (t, 1.95H), 1.24 (t, 1.05H).

EXAMPLE 259

(2RS,3R)-3-amino-5-(cyclohexylacetyl)-5-(ethyl- sulfanyl)-2-hydroxyheptanoyl)-3-fluorobenzoazide

[0964] The desired product was prepared by substituting cyclohexylacetic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[0965] MS(ESI) m/e 332 (M+H)+

[0966] 'H NMR (500 MHz, CD3OD) δ 4.41 (d, 0.35), 4.36 (d, 0.65), 3.73 (m, 1H), 2.67 (dd, 2H), 2.59 (dd, 1H), 2.55 (dd, 0.78H), 2.16-2.07 (m, 3H), 1.95 (dt, 1H), 1.65-1.81 (m, 9H), 1.26 (t, 1.95H), 1.24 (t, 1.05H), 1.02 (dd, 2H).

EXAMPLE 261

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-pentanoyl)-4-bromobenzoazide

[0967] The desired product was prepared by substituting 4-bromobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[0968] MS(ESI) m/e 391 (M+H)+

[0969] 'H NMR (500 MHz, CD3OD) δ 7.80 (m, 2H), 7.68 (m, 2H), 4.49 (d, 0.35), 4.44 (d, 0.65), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).
EXAMPLE 262
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-
(phenylacetyl)pentanohydrazide

[0970] The desired product was prepared by substituting
phenylacetic acid for 3-(ethylsulfanyl)benzoic acid in
Example 239B.

[0971] MS(ESI) m/e 326 (M+H)+;

[0972] 1H NMR (500 MHz, CD3OD) δ 7.35-7.23 (m, 5H),
4.41 (d, 0.35), 4.37 (d, 0.65), 3.72 (m, 1H), 3.61 (d, 2H),
2.67 (t, 2H), 2.58 (dd, 1.3H), 2.53 (dd, 0.7H), 2.11 (dd, 1H),
1.94 (dt, 1H), 1.25 (t, 1.95H), 1.21 (t, 1.05H).

EXAMPLE 263
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-
(2-methoxyphenyl)acetyl)pentanohydrazide

[0973] The desired product was prepared by substituting
2-methoxyphenylacetic acid for 3-(ethylsulfanyl)benzoic acid
in Example 239B.

[0974] MS(ESI) m/e 356 (M+H)+;

[0975] 1H NMR (500 MHz, CD3OD) δ 7.21 (dt, 1H), 6.94
(d, 1H), 6.90 (d, 1H), 6.81 (m, 1H), 4.41 (d, 0.35), 4.37 (d,
0.65), 3.78 (s, 3H), 3.72 (m, 1H), 3.58 (d, 2H), 2.67 (t, 2H),
2.58 (dd, 1.3H), 2.53 (dd, 0.7H), 2.11 (dd, 1H), 1.94 (dt, 1H),
1.25 (t, 1.95H), 1.21 (t, 1.05H).

EXAMPLE 264
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-
(3-methoxyphenyl)acetyl)pentanohydrazide

[0976] The desired product was prepared by substituting
3-methoxyphenylacetic acid for 3-(ethylsulfanyl)benzoic acid
in Example 239B.

[0977] MS(ESI) m/e 356 (M+H)+;

[0978] 1H NMR (500 MHz, CD3OD) δ 7.25 (m, 2H), 6.95
(d, 1H), 6.90 (d, 1H), 4.41 (d, 0.35), 4.37 (d, 0.65), 3.83 (s,
3H), 3.72 (m, 1H), 3.61 (dd, 2H), 2.67 (t, 2H), 2.58 (dd,
1.3H), 2.53 (dd, 0.7H), 2.11 (dd, 1H), 1.94 (dt, 1H), 1.25 (t,
1.95H), 1.21 (t, 1.05H).

EXAMPLE 265
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-
((4-methoxyphenyl)acetyl)pentanohydrazide

[0979] The desired product was prepared by substituting
4-methoxyphenylacetic acid for 3-(ethylsulfanyl)benzoic acid
in Example 239B.

[0980] MS(ESI) m/e 356 (M+H)+;

[0981] 1H NMR (500 MHz, CD3OD) δ 7.25 (d, 2H), 6.87
(dd, 2H), 4.41 (d, 0.35), 4.37 (d, 0.65), 3.77 (s, 3H), 3.72 (m,
1H), 3.53 (d, 2H), 2.67 (t, 2H), 2.58 (dd, 1.3H), 2.53 (dd,
0.7H), 2.11 (dd, 1H), 1.94 (dt, 1H), 1.25 (t, 1.95H), 1.21 (t,
1.05H).

EXAMPLE 266
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-
((2-chlorophenyl)acetyl)pentanohydrazide

[0982] The desired product was prepared by substituting
2-chlorophenylacetic acid for 3-(ethylsulfanyl)benzoic acid
in Example 239B.

[0983] MS(ESI) m/e 360 (M+H)+;

[0984] 1H NMR (500 MHz, CD3OD) δ 7.43 (m, 2H), 7.27
(m, 2H), 4.42 (d, 0.35), 4.38 (d, 0.65), 3.80 (d, 1H), 3.78 (s,
1H), 3.73 (m, 1H), 2.67 (t, 2H), 2.58 (dd, 1.3H), 2.53 (dd,
0.7H), 2.11 (dd, 1H), 1.94 (dt, 1H), 1.25 (t, 1.95H), 1.21 (t,
1.05H).

EXAMPLE 267
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-
((3-chlorophenyl)acetyl)pentanohydrazide

[0985] The desired product was prepared by substituting
3-chlorophenylacetic acid for 3-(ethylsulfanyl)benzoic acid
in Example 239B.

[0986] MS(ESI) m/e 360 (M+H)+;

[0987] 1H NMR (500 MHz, CD3OD) δ 7.39 (m, 1H),
7.25-7.31 (m, 3H), 4.42 (d, 0.35), 4.38 (d, 0.65), 3.72 (m,
1H), 3.61 (d, 2H), 2.67 (t, 2H), 2.58 (dd, 1.3H), 2.53 (dd,
0.7H), 2.11 (dd, 1H), 1.94 (dt, 1H), 1.25 (t, 1.95H), 1.21 (t,
1.05H).

EXAMPLE 268
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-
((4-chlorophenyl)acetyl)pentanohydrazide

[0988] The desired product was prepared by substituting
4-chlorophenylacetic acid for 3-(ethylsulfanyl)benzoic acid
in Example 239B.

[0989] MS(ESI) m/e 360 (M+H)+;

[0990] 1H NMR (500 MHz, CD3OD) δ 7.32 (m, 4H), 4.42
(d, 0.35), 4.37 (d, 0.65), 3.72 (m, 1H), 3.61 (d, 2H), 2.67 (t,
2H), 2.58 (dd, 1.3H), 2.53 (dd, 0.7H), 2.11 (dd, 1H), 1.94 (dt,
1H), 1.25 (t, 1.95H), 1.21 (t, 1.05H).

EXAMPLE 269
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-
pentanoyl)-1-(1,1'-biphenyl)-4-ylacetoxydrazide

[0991] The desired product was prepared by substituting
4-phenylphenylacetic acid for 3-(ethylsulfanyl)benzoic acid
in Example 239B.

[0992] MS(ESI) m/e 402 (M+H)+;

[0993] 1H NMR (500 MHz, CD3OD) δ 7.58 (m, 4H), 7.42
(m, 4H), 7.32 (m, 1H), 4.42 (d, 0.35), 4.38 (d, 0.65), 3.72 (m,
1H), 3.65 (d, 2H), 2.67 (t, 2H), 2.58 (dd, 1.3H), 2.53 (dd,
0.7H), 2.11 (dd, 1H), 1.94 (dt, 1H), 1.25 (t, 1.95H), 1.21 (t,
1.05H).

EXAMPLE 270
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-
pentanoyl)-2-(4-dimethylaminophenyl)acetohyd-
drazide

[0994] The desired product was prepared by substituting
4-dimethylaminophenylacetic acid for 3-(ethylsulfanyl)benzoic
acid in

[0995] 1H NMR (500 MHz, CD3OD) δ 7.36 (m, 2H), 7.13
(m, 2H), 4.42 (d, 0.35), 4.37 (d, 0.65), 3.72 (m, 1H), 3.59
EXAMPLE 271
N'-(2RS,3R)-3-amino-5-(ethoxysulfanyl)-2-hydroxy- 
pentanoyl)-2-(1-naphthylacetohydrazide

EXAMPLE 272
N'-(2RS,3R)-3-amino-5-(ethoxysulfanyl)-2-hydroxy- 
pentanoyl)-2-naphthylacetohydrazide

EXAMPLE 273
N'-(2RS,3R)-3-amino-5-(ethyl sulfanyl)-2-hydroxy- 
pentanoyl)-2-furohydrazide

EXAMPLE 274
N'-(2RS,3R)-3-amino-5-(ethoxysulfanyl)-2-hydroxy- 
pentanoyl)-3-furohydrazide

EXAMPLE 275
N'-(2RS,3R)-3-amino-5-(ethoxysulfanyl)-2-hydroxy- 
pentanoyl)-2-thiophenecarboxyhydrazide

EXAMPLE 276
N'-(2RS,3R)-3-amino-5-(ethoxysulfanyl)-2-hydroxy- 
pentanoyl)-3-thiophenecarboxyhydrazide

EXAMPLE 277
N'-(2RS,3R)-3-amino-5-(ethoxysulfanyl)-2-hydroxy- 
pentanoyl)-1H-pyrrole-2-carboxyhydrazide

EXAMPLE 278
N'-(2RS,3R)-3-amino-5-(ethoxysulfanyl)-2-hydroxy- 
pentanoyl)-1,3-thiazole-2-carboxyhydrazide

EXAMPLE 279
N'-(2RS,3R)-3-amino-5-(ethoxysulfanyl)-2-hydroxy- 
pentanoyl)-1,3-thiazole-4-carboxyhydrazide

[0085] The desired product was prepared by substituting 
2-thiophene carboxylic acid for 3-(ethoxysulfanyl)benzoic acid in Example 239B.

[0090] MS(MCl) m/e 318 (M+H)⁺;

[0100] ¹H NMR (500 MHz, CD₂OD) δ 7.79 (dd, 0.65H), 7.78 (dd, 0.35H), 7.77 (dd, 0.65H), 7.75 (dd, 0.35H), 7.17 (m, 1H), 4.47 (d, 0.35), 4.43 (d, 0.65), 3.76 (m, 1H), 2.70 (t, 
2H), 2.60 (dd, 1.3H), 2.58 (dd, 0.7H), 2.16 (dd, 1H), 1.98 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

[0111] The desired product was prepared by substituting 
3-thiophene carboxylic acid for 3-(ethoxysulfanyl)benzoic acid in Example 239B.

[0112] MS(MCl) m/e 318 (M+H)⁺;

[0113] The desired product was prepared by substituting 
2-pyrrole carboxylic acid for 3-(ethoxysulfanyl)benzoic acid in Example 239B.

[0114] MS(MCl) m/e 301 (M+H)⁺;

[0115] ¹H NMR (500 MHz, CD₂OD) δ 6.99 (dd, 0.65H), 6.98 (dd, 0.35H), 6.91 (dd, 0.65H), 6.89 (dd, 0.35H), 6.21 (m, 1H), 4.46 (d, 0.35), 4.42 (d, 0.65), 3.77 (m, 1H), 2.71 (m, 2H), 2.60 (dd, 1.3H), 2.58 (dd, 0.7H), 2.15 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 278
N'-(2RS,3R)-3-amino-5-(ethoxysulfanyl)-2-hydroxy- 
pentanoyl)-1,3-thiazole-2-carboxyhydrazide

EXAMPLE 279
N'-(2RS,3R)-3-amino-5-(ethoxysulfanyl)-2-hydroxy- 
pentanoyl)-1,3-thiazole-4-carboxyhydrazide

[0119] The desired product was prepared by substituting 
4-thiophene carboxylic acid for 3-(ethoxysulfanyl)benzoic acid in Example 239B.
[1020] MS(ESI) m/z 319 (M+H)+;

[1021] 1H NMR (500 MHz, CD3OD) δ 8.06 (d, 0.65H), 9.04 (d, 0.35H), 8.40 (d, 0.65H), 8.37 (d, 0.35H), 4.48 (d, 0.35), 4.45 (d, 0.65), 3.79 (m, 1H), 2.71 (t, 2H), 2.60 (dd, 1.3H), 2.58 (dd, 0.7H), 2.16 (dd, 1H), 1.98 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 280
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-1,3-thiazole-5-carboxhydrazide

[1022] The desired product was prepared by substituting 5-thiazole carboxylic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1023] MS(ESI) m/z 319 (M+H)+;

[1024] 1H NMR (500 MHz, CD3OD) δ 8.21 (s, 0.65H), 9.19 (s, 0.35H), 8.49 (s, 0.65H), 8.47 (s, 0.35H), 4.49 (d, 0.35), 4.44 (d, 0.65), 3.78 (m, 1H), 2.70 (t, 2H), 2.60 (dd, 1.3H), 2.58 (dd, 0.7H), 2.16 (dd, 1H), 1.98 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 281
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-1H-pyrazole-5-carboxhydrazide

[1025] The desired product was prepared by substituting 1H-pyrazole-5-carboxylic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1026] MS(ESI) m/z 302 (M+H)+;

[1027] 1H NMR (500 MHz, CD3OD) δ 7.74 (d, 0.65H), 7.73 (d, 0.35H), 8.83 (m, 1H), 4.47 (d, 0.35), 4.43 (d, 0.65), 3.78 (m, 1H), 2.70 (t, 2H), 2.60 (dd, 1.3H), 2.58 (dd, 0.7H), 2.15 (dd, 1H), 1.98 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 282
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-1H-pyrazole-4-carboxhydrazide

[1028] The desired product was prepared by substituting 1H-pyrazole-4-carboxylic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1029] MS(ESI) m/z 302 (M+H)+;

[1030] 1H NMR (500 MHz, CD3OD) δ 8.11 (s, 1H), 8.10 (s, 1H), 4.47 (d, 0.35), 4.43 (d, 0.65), 3.76 (m, 1H), 2.70 (t, 2H), 2.60 (dd, 1.3H), 2.58 (dd, 0.7H), 2.15 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 283
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-5-isoxazolecarboxhydrazide

[1031] The desired product was prepared by substituting 5-isoxazole carboxylic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1032] MS(ESI) m/z 303 (M+H)+;

[1033] 1H NMR (500 MHz, CD3OD) δ 8.58 (d, 0.65H), 8.56 (d, 0.35H), 7.09 (d, 0.65H), 7.06 (d, 0.35H), 4.49 (d, 0.35), 4.44 (d, 0.65), 3.78 (m, 1H), 2.70 (t, 2H), 2.60 (dd, 0.7H), 2.16 (dd, 1H), 1.97 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 284
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-pyridinecarboxhydrazide

[1034] The desired product was prepared by substituting 2-pyridine carboxylic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1035] MS(ESI) m/z 313 (M+H)+;

[1036] 1H NMR (500 MHz, CD3OD) δ 8.67 (t, 1H), 8.11 (t, 1H), 7.99 (m, 1H), 7.60 (m, 1H), 4.49 (d, 0.35), 4.45 (d, 0.65), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 1.3H), 2.58 (dd, 0.7H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.28 (t, 1.95H), 1.26 (t, 1.05H).

EXAMPLE 285
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-(2-pyridinyl)acetohydrazide

[1037] The desired product was prepared by substituting 2-pyridylacetic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1038] MS(ESI) m/z 327 (M+H)+;

[1039] 1H NMR (500 MHz, CD3OD) δ 8.63 (d, 0.35H), 8.59 (d, 0.65H), 8.11 (dt, 0.35H), 8.04 (d, 0.65H), 7.71 (d, 0.35H), 7.66 (d, 0.65H), 7.59 (dd, 0.35H), 7.53 (dd, 0.65H), 4.44 (d, 0.35), 4.38 (d, 0.65), 3.73 (m, 1H), 2.67 (t, 2H), 2.58 (dd, 1.3H), 2.52 (dd, 0.7H), 2.10 (dd, 1H), 1.93 (dt, 1H), 1.25 (t, 1.95H), 1.20 (t, 1.05H).

EXAMPLE 286
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-pyridinecarboxhydrazide

[1040] The desired product was prepared by substituting 3-pyridylacetic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1041] MS(ESI) m/z 313 (M+H)+;

[1042] 1H NMR (500 MHz, CD3OD) δ 8.04 (m, 1H), 8.77 (d, 1H), 8.32 (dd, 0.35H), 8.30 (dd, 0.65H), 7.61 (d, 0.35H), 7.60 (d, 0.65H), 4.51 (d, 0.35), 4.46 (d, 0.65), 3.79 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 1.3H), 2.58 (dd, 0.7H), 2.17 (dd, 1H), 2.00 (dt, 1H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 287
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-(3-pyridinyl)acetohydrazide

[1043] The desired product was prepared by substituting 3-pyridylacetic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1044] MS(ESI) m/z 327 (M+H)+;

[1045] 1H NMR (500 MHz, CD3OD) δ 8.69 (d, 1H), 8.61 (m, 1H), 8.24 (d, 0.35H), 8.19 (dd, 0.65H), 7.75 (dd, 0.35H), 7.71 (dd, 0.65H), 4.44 (d, 0.35), 4.38 (d, 0.65), 3.81 (m, 2H).
3.73 (m, 1H), 2.67 (t, 2H), 2.57 (dd, 1.3H), 2.52 (dd, 0.7H), 2.10 (dd, 1H), 1.93 (dt, 1H), 1.25 (t, 1.9H), 1.20 (t, 1.05H).

EXAMPLE 288

N'-((2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl)-4-pyridinecarboxyhydrazide

[1046] The desired product was prepared by substituting 4-pyridine carboxylic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1047] MS(ESI) m/e 313 (M+H)+;

[1048] 1H NMR (500 MHz, CD3OD) δ 8.76 (m, 2H), 7.86 (m, 2H), 4.51 (d, 0.35), 4.45 (d, 0.65), 3.79 (m, 1H), 2.71 (t, 2H), 2.60 (dd, 1.3H), 2.58 (dd, 0.7H), 2.17 (dd, 1H), 2.00 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 289

N'-((2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl)-2-(4-pyridyl)acetohydrazide

[1049] The desired product was prepared by substituting 4-pyridylacetic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1050] MS(ESI) m/e 327 (M+H)+;

[1051] 1H NMR (500 MHz, CD3OD) δ 8.68 (t, 2H), 7.87 (d, 0.711), 7.83 (d, 1.3H), 4.45 (d, 0.35), 4.38 (d, 0.65), 3.73 (m, 1H), 2.67 (t, 2H), 2.58 (dd, 1.3H), 2.52 (dd, 0.7H), 2.10 (dd, 1H), 1.93 (dt, 1H), 1.25 (t, 1.95H), 1.20 (t, 1.05H).

EXAMPLE 290

N'-((2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl)-3-pyridazincarboxyhydrazide

[1052] The desired product was prepared by substituting 3-pyridazine carboxylic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1053] MS(ESI) m/e 314 (M+H)+;

[1054] 1H NMR (500 MHz, CD3OD) δ 9.37 (dd, 1H), 8.31 (dd, 1H), 7.92 (dd, 1H), 4.51 (d, 0.35), 4.47 (d, 0.65), 3.81 (m, 1H), 2.72 (t, 2H), 2.61 (dd, 1H), 2.18 (dd, 1H), 2.00 (dt, 1H), 1.28 (t, 1.95H), 1.26 (t, 1.05H).

EXAMPLE 291

N'-((2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl)-4-pyrimidincarboxyhydrazide

[1055] The desired product was prepared by substituting 4-pyrimidine carboxylic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1056] MS(ESI) m/e 314 (M+H)+;

[1057] 1H NMR (500 MHz, CD3OD) δ 89.31 (m, 0.65H), 9.30 (d, 0.35H), 9.07 (d, 0.65H), 9.06 (0.35H), 8.11 (dd, 0.65H), 8.00 (dd, 0.35H), 4.50 (d, 0.35), 4.45 (d, 0.65), 3.79 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.26 (t, 1.05H).

EXAMPLE 292

N'-((2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl)-2-pyrazincarboxyhydrazide

[1058] The desired product was prepared by substituting 2-pyrazine carboxylic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1059] MS(ESI) m/e 314 (M+H)+;

[1060] 1H NMR (500 MHz, CD3OD) δ 89.25 (d, 0.65H), 9.24 (d, 0.35H), 8.85 (d, 0.65H), 8.83 (0.35H), 8.72 (dd, 0.65H), 8.71 (dd, 0.35H), 4.50 (d, 0.35), 4.46 (d, 0.65), 3.80 (m, 1H), 2.71 (t, 2H), 2.60 (t, 2H), 2.18 (dd, 1H), 1.99 (dt, 1H), 1.28 (t, 1.95H), 1.26 (t, 1.05H).

EXAMPLE 293

N'-((2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl)-4-isopropylbenzoylhydrazide

[1061] The desired product was prepared by substituting 4-(2-methylbenzophenon)benzoic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1062] MS(ESI) m/e 355 (M+H)+;

[1063] 1H NMR (500 MHz, CD3OD) δ 7.82 (m, 2H), 7.37 (m, 2H), 4.48 (d, 0.35), 4.44 (d, 0.65), 3.78 (m, 1H), 2.71 (t, 2H), 2.60 (dd, 2H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.24-1.29 (m, 10H).

EXAMPLE 294

N'-((2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl)-4-propoxybenzoylhydrazide

[1064] The desired product was prepared by substituting 4-propoxybenzoic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1065] MS(ESI) m/e 370 (M+H)+;

[1066] 1H NMR (500 MHz, CD3OD) δ 7.86 (m, 2H), 7.01 (m, 2H), 4.48 (d, 0.35), 4.44 (d, 0.65), 4.01 (dt, 2H), 3.77 (m, 1H), 2.71 (t, 2H), 2.60 (dd, 2H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.82 (dd, 2H), 1.28 (t, 1.95H), 1.25 (t, 1.05H) 1.05 (t, 3H).

EXAMPLE 295

N'-((2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl)-4-(methylsulfonyl)benzoylhydrazide

[1067] The desired product was prepared by substituting 4-methylsulfonylbenzoic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1068] MS(ESI) m/e 358 (M+H)+;

[1069] 1H NMR (500 MHz, CD3OD) δ 7.81 (m, 2H), 7.35 (m, 2H), 4.48 (d, 0.35), 4.44 (d, 0.65), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.53 (s, 3H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 296

N'-((2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl)-4-isopropoxybenzoylhydrazide

[1070] The desired product was prepared by substituting 4-(2-methylthioxy)benzoic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1071] MS(ESI) m/e 370 (M+H)+;

[1072] 1H NMR (500 MHz, CD3OD) δ 7.84 (m, 2H), 6.99 (m, 2H), 4.71 (dd, 1H), 4.48 (d, 0.35), 4.44 (d, 0.65), 3.78
(m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 2.00 (dt, o 1H), 1.34 (d, 6H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 297
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-pentanoyl)-4-(diethylyaminobenzohydrazide

[1073] The desired product was prepared by substituting 4-(diethylyaminobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1074] MS(ESI) m/e 383 (M+H)+;

[1075] 1H NMR (500 MHz, DMSO-d6) δ 7.76 (dd, 2H), 6.73 (m, 2H), 4.47 (d, 0.35), 4.43 (d, 0.65), 3.77 (m, 1H), 3.46 (q, 4H), 2.70 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 2.00 (dt, 1H), 1.28 (t, 1.95H), 1.26 (t, 1.05H), 1.19 (t, 6H).

EXAMPLE 298
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-pentanoyl)-4-butoxybenzohydrazide

[1076] The desired product was prepared by substituting 4-butoxybenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1077] MS(ESI) m/e 384 (M+H)+;

[1078] 1H NMR (500 MHz, CD3OD) δ 7.85 (m, 2H), 6.99 (m, 2H), 4.48 (d, 0.35), 4.44 (d, 0.65), 4.06 (dt, 2H), 3.77 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 2.00 (dt, 1H), 1.78 (dd, 2H), 1.53 (dd, 2H), 1.28 (t, 1.95H), 1.26 (t, 1.05H), 0.99 (t, 3H).

EXAMPLE 299
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-pentanoyl)-3,4-diethylyaminobenzohydrazide

[1079] The desired product was prepared by substituting 2,3-diethylyaminobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1080] MS(ESI) m/e 400 (M+H)+;

[1081] 1H NMR (500 MHz, CD3OD) δ 7.52 (dd, 1H), 7.48 (dd, 1H), 7.03 (m, 1H), 4.48 (d, 0.35), 4.44 (d, 0.65), 4.13 (m, 4H), 3.77 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 2.00 (dt, 1H), 1.43 (m, 6H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 300
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-pentanoyl)-4-chlorobenzohydrazide

[1082] The desired product was prepared by substituting 4-chlorobenzolic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1083] MS(ESI) m/e 346 (M+H)+;

[1084] 1H NMR (500 MHz, CD3OD) δ 7.87 (dd, 2H), 7.52 (dd, 2H), 4.49 (d, 0.35), 4.44 (d, 0.65), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 301
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-pentanoyl)-2-bromobenzohydrazide

[1085] The desired product was prepared by substituting 2-bromobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1086] MS(ESI) m/e 391 (M+H)+;

[1087] 1H NMR (500 MHz, CD3OD) δ 7.69 (dd, 1H), 7.59 (dd, 1H), 7.47 (m, 1H), 7.41 (m, 1H), 4.48 (d, 0.35), 4.43 (d, 0.65), 3.79 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.24 (t, 1.05H).

EXAMPLE 302
(2RS,3R)-3-amino-N'-(2RS,3S)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-hydroxy-5-(isopropylsulfanyl)pentanoyldiazide

[1088] The title compound is obtained by substituting hydrazine hydrate for O-phenylhydroxylamine hydrochloride and Example 123B for Example 98A in Example 98B.

[1089] MS(ESI) m/e 409 (M+H)+;

[1090] 1H NMR (500 MHz, DMSO-d6) δ 8.09 (br s, 1H), 10.11 & 9.93 (s, 1H), 8.2 & 8.02 (m, 4H), 6.8 & 6.65(br s, 2H), 4.44 & 4.28 (m, 1H), 4.2 (m, 1H), 3.0-2.9 (m, 2H), 2.75-2.55 (m, 4H), 1.95-1.75 (m, 4H), 1.2 (d, 12H).

EXAMPLE 304
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-pentanoyl)-3-(dimethylamino)benzohydrazide

[1091] The desired product was prepared by substituting 3-dimethylaminobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1092] MS(ESI) m/e 355 (M+H)+;

[1093] 1H NMR (500 MHz, CD3OD) δ 7.32 (dd, 1H), 7.28 (m, 1H), 7.21 (d, 1H), 7.01 (dd, 1H), 4.48 (d, 0.35), 4.44 (d, 0.65), 3.79 (m, 1H), 3.00 (s, 6H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (d, 1H), 2.00 (dt, 1H), 1.28 (t, 1.95H), 1.26 (t, 1.05H).

EXAMPLE 305
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-pentanoyl)-4-(dimethylamino)benzohydrazide

[1094] The desired product was prepared by substituting 4-dimethylaminobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1095] MS(ESI) m/e 355 (M+H)+;

[1096] 1H NMR (500 MHz, CD3OD) δ 7.78 (dd, 2H), 6.75 (d, 2H), 4.46 (d, 0.35), 4.43 (d, 0.65), 3.77 (m, 1H), 3.04 (s, 6H), 2.70 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 2.00 (dt, 1H), 1.28 (t, 1.95H), 1.26 (t, 1.05H).

EXAMPLE 306
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-pentanoyl)-3-(trifluoromethyl)benzohydrazide

[1097] The desired product was prepared by substituting 3-(trifluoromethyl)benzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1098] MS(ESI) m/e 380 (M+H)+;

[1099] 1H NMR (500 MHz, CD3OD) δ 8.21 (d, 1H), 8.14 (t, 1H), 7.92 (t, 1H), 7.73 (dd, 1H), 4.50 (d, 0.35), 4.46 (d, 0.65), 3.79 (m, 1H), 2.72 (t, 2H), 2.61 (dd, 2H), 2.18 (dd, 1H), 2.00 (dt, 1H), 1.28 (t, 1.95H), 1.26 (t, 1.05H).
EXAMPLE 307
N'-(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl-4-(trifluoromethyl)benzohydrazide

[1100] The desired product was prepared by substituting 4-(trifluoromethyl)benzoic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1101] MS(ESI) m/e 380 (M+H)+;

[1102] 1H NMR (500 MHz, CD3OD) δ 8.05 (dd, 2H), 7.82 (dd, 2H), 4.50 (d, 0.35), 4.45 (d, 0.65), 3.79 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (dd, 1H), 2.00 (dt, 1H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 308
N'-(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl-3-(trifluoromethoxy)benzohydrazide

[1103] The desired product was prepared by substituting 3-(trifluoromethoxy)benzoic acid for 3-(ethylsulfonyl)benzolic acid in Example 239B.

[1104] MS(ESI) m/e 396 (M+H)+;

[1105] 1H NMR (500 MHz, CD3OD) δ 7.89 (dd, 1H), 7.80 (dd, 1H), 7.62 (dd, 1H), 7.53 (dd, 1H), 4.50 (d, 0.35), 4.45 (d, 0.65), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (dd, 1H), 2.00 (dt, 1H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 309
N'-(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl-4-phenoxybenzohydrazide

[1106] The desired product was prepared by substituting 4-phenoxybenzoic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1107] MS(ESI) m/e 404 (M+H)+;

[1108] 1H NMR (500 MHz, CD3OD) δ 7.89 (m, 2H), 7.42 (m, 2H), 7.22 (m, 1H), 7.08 (m, 2H), 7.04 (m, 2H), 4.48 (d, 0.35), 4.44 (d, 0.65), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 2.00 (dt, 1H), 1.27 (t, 1.95H), 1.26 (t, 1.05H).

EXAMPLE 310
N'-(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl-4-(4-phenoxyphenyl)benzohydrazide

[1109] The desired product was prepared by substituting 4-(4-phenoxyphenyl)benzoic acid for 3-(ethylsulfonyl)benzolic acid in Example 239B.

[1110] MS(ESI) m/e 418 (M+H)+;

[1111] 1H NMR (500 MHz, CD3OD) δ 7.87 (m, 2H), 7.44 (d, 2H), 7.38 (t, 2H), 7.32 (t, 1H), 7.11 (m, 2H), 5.17 (s, 2H), 4.48 (d, 0.35), 4.44 (d, 0.65), 3.77 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 2.00 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 311
N'-(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl-2,3-dimethylbenzohydrazide

[1112] The desired product was prepared by substituting 2,3-dimethylbenzoic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1113] MS(ESI) m/e 340 (M+H)+;

[1114] 1H NMR (500 MHz, CD3OD) δ 7.29 (m, 2H), 7.16 (m, 1H), 4.48 (d, 0.35), 4.43 (d, 0.65), 3.80 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.36 (s, 3H), 2.32 (s, 3H), 2.17 (dd, 1H), 1.99 (dt, 1H), 1.28 (t, 1.95H), 1.24 (t, 1.05H).

EXAMPLE 312
N'-(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl-2,4-dimethylbenzohydrazide

[1115] The desired product was prepared by substituting 2,4-dimethylbenzoic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1116] MS(ESI) m/e 340 (M+H)+;

[1117] 1H NMR (500 MHz, CD3OD) δ 7.40 (m, 1H), 7.12 (dd, 1H), 7.08 (dd, 1H), 4.48 (d, 0.35), 4.43 (d, 0.65), 3.79 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.43 (s, 3H), 2.34 (s, 3H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.24 (t, 1.05H).

EXAMPLE 313
N'-(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl-2,5-dimethylbenzohydrazide

[1118] The desired product was prepared by substituting 2,5-dimethylbenzoic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1119] MS(ESI) m/e 340 (M+H)+;

[1120] 1H NMR (500 MHz, CD3OD) δ 7.33 (m, 1H), 7.21 (dd, 1H), 7.17 (m, 1H), 4.48 (d, 0.35), 4.43 (d, 0.65), 3.79 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.41 (s, 3H), 2.34 (s, 3H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.24 (t, 1.05H).

EXAMPLE 314
N'-(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl-4,5-dimethylbenzohydrazide

[1121] The desired product was prepared by substituting 3,4-dimethylbenzoic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1122] MS(ESI) m/e 340 (M+H)+;

[1123] 1H NMR (500 MHz, CD3OD) δ 7.68 (d, 1H), 7.61 (dd, 1H), 7.25 (m, 1H), 4.48 (d, 0.35), 4.44 (d, 0.65), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.33 (s, 6H), 2.16 (dd, 1H), 2.00 (dt, 1H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 315
N'-(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxy-pentanoyl-3,5-dimethylbenzohydrazide

[1124] The desired product was prepared by substituting 3,5-dimethylbenzoic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1125] MS(ESI) m/e 340 (M+H)+;

[1126] 1H NMR (500 MHz, CD3OD) δ 7.50 (d, 2H), 7.25 (d, 1H), 4.48 (d, 0.35), 4.44 (d, 0.65), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.37 (s, 6H), 2.16 (dd, 1H), 2.00 (dt, 1H), 1.28 (t, 1.95H), 1.26 (t, 1.05H).
EXAMPLE 316

N^-(2RS,3R)-3-aminoo-5-(ethylsulfanyl)-2-hydroxy-pentanal)-2,3-dimethoxybenzhydrazide

[1127] The desired product was prepared by substituting 2,3-dimethoxybenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1128] MS(ESI) m/e 372 (M+H)^+;

[1129] 1H NMR (500 MHz, CD2OD) δ 7.42 (dd, 0.65H), 7.40 (dd, 0.35H), 7.24 (ddd, 1H), 7.19 (m, 1H), 4.48 (d, 0.35), 4.44 (d, 0.65), 3.95 (s, 1.95H), 3.94 (s, 1.05H), 3.91 (s, 1.95H), 3.90 (s, 1.05H), 3.79 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 317

N^-(2RS,3R)-3-aminoo-5-(ethylsulfanyl)-2-hydroxy-pentanal)-2,4-dimethoxybenzhydrazide

[1130] The desired product was prepared by substituting 2,4-dimethoxybenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1131] MS(ESI) m/e 372 (M+H)^+;

[1132] 1H NMR (500 MHz, CD2OD) δ 7.98 (m, 1H), 6.68 (m, 2H), 4.47 (d, 0.35), 4.44 (d, 0.65), 4.00 (s, 1.95H), 3.99 (s, 1.05H), 3.88 (s, 3H), 3.78 (m, 1H), 2.70 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 318

N^-(2RS,3R)-3-aminoo-5-(ethylsulfanyl)-2-hydroxy-pentanal)-2,5-dimethoxybenzhydrazide

[1133] The desired product was prepared by substituting 2,5-dimethoxybenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1134] MS(ESI) m/e 372 (M+H)^+;

[1135] 1H NMR (500 MHz, CD2OD) δ 7.54 (dd, 0.65H), 7.53 (dd, 0.35H), 7.14 (m, 2H), 4.48 (d, 0.35), 4.45 (d, 0.65), 3.96 (s, 1.95H), 3.95 (s, 1.05H), 3.79 (s, 3H), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 319

N^-(2RS,3R)-3-aminoo-5-(ethylsulfanyl)-2-hydroxy-pentanal)-3,4-dimethoxybenzhydrazide

[1136] The desired product was prepared by substituting 3,4-dimethoxybenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1137] MS(ESI) m/e 372 (M+H)^+;

[1138] 1H NMR (500 MHz, CD2OD) δ 7.55 (ddd, 1H), 7.49 (dd, 1H), 7.05 (m, 1H), 4.48 (d, 0.35), 4.44 (d, 0.65), 3.90 (s, 1.95H), 3.89 (s, 1.05H), 3.88 (s, 3H), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (dd, 1H), 2.00 (dt, 1H), 1.28 (t, 1.95H), 1.26 (t, 1.05H).

EXAMPLE 320

N^-(2RS,3R)-3-aminoo-5-(ethylsulfanyl)-2-hydroxy-pentanal)-3,5-dimethoxybenzhydrazide

[1139] The desired product was prepared by substituting 3,5-dimethoxybenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1140] MS(ESI) m/e 372 (M+H)^+;

[1141] 1H NMR (500 MHz, CD2OD) δ 7.04 (m, 2H), 6.71 (dd, 0.65H), 6.99 (dd, 0.35H), 4.48 (d, 0.35), 4.44 (d, 0.65), 3.83 (s, 6H), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (dd, 1H), 1.99 (dt, 1H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 321

N^-(2RS,3R)-3-aminoo-5-(ethylsulfanyl)-2-hydroxy-pentanal)-1,3-benzodioxole-5-carboxylic acid

[1142] The desired product was prepared by substituting 1,3-benzodioxole carboxylic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1143] MS(ESI) m/e 356 (M+H)^+;

[1144] 1H NMR (500 MHz, CD2OD) δ 7.49 (m, 1H), 7.35 (d, 0.65H), 7.34 (d, 0.35H), 6.92 (m, 1H), 6.06 (s, 1.3H), 6.05 (s, 0.7H), 4.47 (d, 0.35), 4.43 (d, 0.65), 3.77 (m, 1H), 2.70 (t, 2H), 2.60 (dd, 2H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 322

N^-(2RS,3R)-3-aminoo-5-(ethylsulfanyl)-2-hydroxy-pentanal)-3,4-trimethoxybenzhydrazide

[1145] The desired product was prepared by substituting 3,4-trimethoxybenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1146] MS(ESI) m/e 402 (M+H)^+;

[1147] 1H NMR (500 MHz, CD2OD) δ 7.25 (s, 1.3H), 7.24 (s, 0.7H), 4.50 (d, 0.35), 4.45 (d, 0.65), 3.89 (s, 6H), 3.83 (s, 1.95H), 3.82 (s, 1.05H), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (dd, 1H), 2.00 (dt, 1H), 1.28 (t, 1.95H), 1.26 (t, 1.05H).

EXAMPLE 323

N^-(2RS,3R)-3-aminoo-5-(ethylsulfanyl)-2-hydroxy-pentanal)-2,3-dichlorobenzhydrazide

[1148] The desired product was prepared by substituting 2,3-dichlorobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1149] MS(ESI) m/e 381 (M+H)^+;

[1150] 1H NMR (500 MHz, CD2OD) δ 7.68 (ddd, 1H), 7.54 (m, 1H), 7.41 (m, 1H), 4.48 (d, 0.35), 4.43 (d, 0.65), 3.80 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.24 (t, 1.05H).

EXAMPLE 324

N^-(2RS,3R)-3-aminoo-5-(ethylsulfanyl)-2-hydroxy-pentanal)-2,4-dichlorobenzhydrazide

[1151] The desired product was prepared by substituting 2,4-dichlorobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.
EXAMPLE 325

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypropionyl)-2,5-dichlorobenzohydrazide

[1152] MS(ESI) m/z 381 (M+H)+;

[1153] 1H NMR (500 MHz, CD3OD) δ 7.60 (m, 2H), 7.46 (m, 1H), 4.48 (d, 0.35), 4.43 (d, 0.65), 3.79 (m, 1H), 2.71 (t, 2H), 2.60 (dd, 2H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.24 (t, 1.05H).

EXAMPLE 326

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypropionyl)-3,4-dichlorobenzohydrazide

[1154] The desired product was prepared by substituting 2,5-dichlorobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1155] MS(ESI) m/z 381 (M+H)+;

[1156] 1H NMR (500 MHz, CD3OD) δ 7.65 (m, 1H), 7.52 (m, 2H), 4.48 (d, 0.35), 4.43 (d, 0.65), 3.79 (m, 1H), 2.71 (t, 2H), 2.60 (dd, 2H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.24 (t, 1.05H).

EXAMPLE 327

N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypropionyl)-3,5-dichlorobenzohydrazide

[1157] The desired product was prepared by substituting 3,4-dichlorobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1158] MS(ESI) m/z 381 (M+H)+;

[1159] 1H NMR (500 MHz, CD3OD) δ 8.05 (d, 0.65H), 8.04 (d, 0.35H), 7.80 (m, 1H), 7.68 (m, 1H), 4.49 (d, 0.35), 4.44 (d, 0.65), 3.79 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 328

N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutyl)-2-hydroxybenzohydrazide

[1160] The desired product was prepared by substituting 3,5-dichlorobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.

[1161] MS(ESI) m/z 381 (M+H)+;

[1162] 1H NMR (500 MHz, CD3OD) δ 7.85 (d, 1.3H), 7.83 (d, 0.7H), 7.72 (t, 0.65H), 7.70 (t, 0.35H), 4.49 (d, 0.35), 4.44 (d, 0.65), 3.79 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.16 (dd, 1H), 1.99 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

EXAMPLE 329

N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutyl)-2-methylbenzohydrazide

[1156] The desired compound was prepared by substituting Example 1C for Example 97A in acid in Example 239A.

EXAMPLE 329A

N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutyl)-2-methylbenzohydrazide

[1167] To DCC resin (148 mg, 0.225 mmol) in 1.0 mL of dichloromethane was added 0.5 mL of a 0.45 M solution of HOBr (0.225 mmol) in dimethylacetamide/dichloromethane (1:1) and 0.5 mL of a 0.3M solution of o-toluic acid (0.15 mmol) in dimethylacetamide. After 5 minutes, 1.0 mL of a 0.225 M solution of Example 329A (0.225 mmol) in dimethylacetamide/dichloromethane (1:1) was added. The mixture was agitated for 18 hours and quenched with 0.19 g of trisamine resin (0.75 mmol) followed by 0.13 g of isocyanate resin (0.225 mmol) and agitated for 4 hours. The mixture was filtered and the resins washed with 1x3 mL of dichloromethane, the solvent was removed in vacuo, and the crude material purified by reverse phase preparative HPLC. The resulting material was treated with 1 mL of 50% trifluoroacetic acid/dichloromethane and agitated at ambient temperature for 18 hours. The solvent was removed in vacuo to give the desired product.

[1168] MS(ESI) m/z 334 (M+H)+;

[1169] 1H NMR (500 MHz, CD3OD) δ 7.50 (m, 1H), 7.39 (dd, 1H), 7.28 (m, 2H), 4.44 (d, 0.3H), 4.36 (d, 0.7H), 3.71 (mn, 0.7H), 3.67 (m, 0.3H), 2.46 (s, 3H), 1.73 (m, 6H), 1.56 (m, 1H), 1.47 (m, 1H), 1.28 (m, 3H), 1.02 (m, 1.4H), 0.93 (m, 0.6H).

EXAMPLE 330

2-amino-N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-benzohydrazide

[1160] The desired compound was prepared by substituting o-aminobenzoic acid for o-toluic acid in Example 329B.

[1170] MS(ESI) m/z 335 (M+H)+;

[1171] 1H NMR (500 MHz, CD3OD) δ 7.57 (m, 1H), 7.25 (m, 1H), 6.80 (m, 1H), 6.67 (m, 1H), 4.44 (d, 0.3H), 4.36 (d, 0.7H), 3.69 (m, 0.7H), 3.65 (m, 0.3H), 1.76 (m, 6H), 1.57 (m, 1H), 1.47 (m, 1H), 1.37-1.20 (m, 3H), 1.03 (m, 1.4H), 0.93 (m, 0.6H).

EXAMPLE 331

4-amino-N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-benzohydrazide

[1173] The desired compound was prepared by substituting p-aminobenzoic acid for o-toluic acid in Example 329B.

[1174] MS(ESI) m/z 335 (M+H)+;
EXAMPLE 332
3-amino-N'-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-benzohydrazide

[1176] The desired compound was prepared by substituting m-aminoobenzoic acid for o-toluic acid in Example 329B.

[1177] MS(ESI) m/e 335 (M+H)+;

[1178] 1H NMR (500 MHz, CD3OD) δ 7.36 (m, 3H), 7.09 (m, 1H), 4.45 (d, 0.25H), 4.36 (d, 0.75H), 3.69 (m, 1H), 1.85-1.64 (m, 6H), 1.56 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.22 (m, 1H), 1.02 (m, 1.5 H), 0.92 (m, 0.5H).

EXAMPLE 333
N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl-3-hydroxybenzohydrazide

[1179] The desired compound was prepared by substituting 3-hydroxybenzoic acid for o-toluic acid in Example 329B.

[1180] MS(ESI) m/e 336 (M+H)+;

[1181] 1H NMR (500 MHz, CD3OD) δ 7.31 (m, 3H), 7.01 (m, 1H), 6.80 (m, 1H), 4.44 (d, 0.3H), 4.36 (d, 0.7H), 3.69 (m, 0.7H), 3.65 (m, 0.3H), 1.85-1.64 (m, 6H), 1.57 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.03 (m, 1.4H), 0.93 (m, 0.6H).

EXAMPLE 334
N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl-4-hydroxybenzohydrazide

[1182] The desired compound was prepared by substituting 4-hydroxybenzoic acid for o-toluic acid in Example 329B.

[1183] MS(ESI) m/e 336 (M+H)+;

[1184] 1H NMR (500 MHz, CD3OD) δ 7.78 (m, 2H), 6.85 (m, 2H), 4.43 (d, 0.3H), 4.36 (d, 0.7H), 3.71-3.62 (m, 1H), 1.75 (m, 6H), 1.57 (m, 1H), 1.47 (m, 1H), 1.38-1.20 (m, 3H), 1.03 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 335
N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl-4-methoxybenzohydrazide

[1185] The desired compound was prepared by substituting p-anisic acid for o-toluic acid in Example 329B.

[1186] MS(ESI) m/e 350 (M+H)+;

[1187] 1H NMR (500 MHz, CD3OD) δ 7.87 (m, 2H), 7.02 (m, 2H), 6.80 (m, 1H), 6.67 (m, 1H), 4.44 (d, 0.3H), 4.36 (d, 0.7H), 3.70-3.64 (m, 1H), 1.84-1.62 (m, 6H), 1.57 (m, 1H), 1.47 (m, 1H), 1.39-1.20 (m, 3H), 1.03 (m, 1.4H), 0.93 (m, 0.6H).

EXAMPLE 336
N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl-2-fluorobenzohydrazide

[1188] The desired compound was prepared by substituting 2-fluorobenzoic acid for o-toluic acid in Example 329B.

[1189] MS(ESI) m/e 338 (M+H)+;

[1190] 1H NMR (500 MHz, CD3OD) δ 7.81 (m, 1H), 7.61 (m, 1H), 7.34-7.23 (m, 2H), 4.44 (d, 0.3H), 4.37 (d, 0.7H), 3.69 (m, 1H), 1.75 (m, 6H), 1.56 (m, 1H), 1.47 (m, 1H), 1.38-1.20 (m, 3H), 1.03 (m, 1.4H), 0.93 (m, 0.6H).

EXAMPLE 337
N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl-3-fluorobenzohydrazide

[1191] The desired compound was prepared by substituting 3-fluorobenzoic acid for o-toluic acid in Example 329B.

[1192] MS(ESI) m/e 338 (M+H)+;

[1193] 1H NMR (500 MHz, CD3OD) δ 7.72 (m, 1H), 7.63 (m, 1H), 6.53 (m, 1H), 7.35 (m, 1H), 4.45 (d, 0.25H), 4.37 (d, 0.75H), 3.68 (m, 1H), 1.83-1.64 (m, 6H), 1.57 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.5H), 0.92 (m, 0.5H).

EXAMPLE 338
N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl-4-fluorobenzohydrazide

[1194] The desired compound was prepared by substituting 4-fluorobenzoic acid for o-toluic acid in Example 329B.

[1195] MS(ESI) m/e 338 (M+H)+;

[1196] 1H NMR (500 MHz, CD3OD) δ 7.95 (m, 2H), 7.24 (m, 2H), 6.53 (m, 1H), 7.35 (m, 1H), 4.45 (d, 0.3H), 4.37 (d, 0.7H), 3.68 (m, 1H), 1.85-1.64 (m, 6H), 1.57 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 339
N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl-2-bromobenzohydrazide

[1197] The desired compound was prepared by substituting 2-bromobenzoic acid for o-toluic acid in Example 329B.

[1198] MS(ESI) m/e 399 (M+H)+;

[1199] 1H NMR (500 MHz, CD3OD) δ 7.72 (m, 1H), 7.69 (m, 1H), 7.46 (m, 1H), 7.41 (m, 1H), 4.44 (d, 0.3H), 4.36 (d, 0.7H), 3.68 (m, 1H), 1.85-1.65 (m, 6H), 1.56 (m, 1H), 1.47 (m, 1H), 1.38-1.18 (m, 3H), 1.03 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 340
N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl-3-cyanobenzohydrazide

[1200] The desired compound was prepared by substituting 3-cyanobenzoic acid for o-toluic acid in Example 329B.

[1201] MS(ESI) m/e 345 (M+H)+;
[1202] 1H NMR (500 MHz, CD3OD) δ 8.23 (m, 1H), 8.17 (m, 1H), 7.96 (m, 1H), 7.71 (m, 1H), 4.46 (d, 0.3H), 4.38 (d, 0.7H), 3.69 (m, 1H), 1.85-1.65 (m, 6H), 1.58 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.5H), 0.92 (m, 0.5H).

EXAMPLE 341

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-cyanobenzohydrazide

[1203] The desired compound was prepared by substituting 4-cyanobenzoic acid for 4-toluic acid in Example 329B.

[1204] MS(ESI) m/z 345 (M+H)+;

[1205] 1H NMR (500 MHz, CD3OD) δ 8.02 (m, 2H), 7.88 (m, 2H), 4.46 (d, 0.3H), 4.37 (d, 0.7H), 3.69 (m, 1H), 1.85-1.65 (m, 6H), 1.56 (m, 1H), 1.46 (m, 1H), 1.33 (m, 2H), 1.24 (m, 11H), 1.03 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 342

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-(dimethylamino)benzohydrazide

[1206] The desired compound was prepared by substituting 3-dimethylaminobenzoic acid for 4-toluic acid in Example 329B.

[1207] MS(ESI) m/z 363 (M+H)+;

[1208] 1H NMR (500 MHz, CD3OD) δ 7.32 (t, 1H), 7.28 (m, 1H), 7.21 (m, 1H), 7.01 (dd, 1H), 4.44 (d, 0.3H), 4.37 (d, 0.7H), 3.68 (m, 1H), 3.01-3.00 (2S, 6H), 1.85-1.65 (m, 6H), 1.57 (m, 1H), 1.47 (m, 1H), 1.32 (m, 2H), 1.24 (m, 1H), 1.03 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 343

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-(dimethylamino)benzohydrazide

[1209] The desired compound was prepared by substituting 4-dimethylaminobenzoic acid for 4-toluic acid in Example 329B.

[1210] MS(ESI) m/z 363 (M+H)+; 1H NMR (500 MHz, CD3OD) δ 7.78 (d, 2H), 7.65 (d, 2H), 6.53 (m, 1H), 4.42 (d, 0.3H), 4.35 (d, 0.7H), 3.68 (m, 1H), 3.04 (2S, 6H), 1.85-1.63 (m, 6H), 1.57 (m, 1H), 1.46 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 344

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-(trifluoromethyl)benzohydrazide

[1211] The desired compound was prepared by substituting 3-(trifluoromethyl)benzoic acid for 4-toluic acid in Example 329B.

[1212] MS(ESI) m/z 388 (M+H)+;

[1213] 1H NMR (500 MHz, CD3OD) δ 8.21 (s, 1H), 8.14 (m, 1H), 7.93 (m, 1H), 7.73 (m, 1H), 4.45 (d, 0.3H), 4.38 (d, 0.7H), 3.69 (m, 1H), 1.85-1.65 (m, 6H), 1.57 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.03 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 345

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-(trifluoromethyl)benzohydrazide

[1214] The desired compound was prepared by substituting 4-(trifluoromethyl)benzoic acid for 4-cyclohexyl-2-hydroxybutanoyl) in Example 329B.

[1215] MS(ESI) m/z 388 (M+H)+; 1H NMR (500 MHz, CD3OD) δ 8.06 (m, 2H), 7.82 (m, 2H), 4.46 (d, 0.3H), 4.38 (d, 0.7H), 3.69 (m, 1H), 1.85-1.65 (m, 6H), 1.57 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 346

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-(trifluoromethoxy)benzohydrazide

[1216] The desired compound was prepared by substituting 3-(trifluoromethoxy)benzoic acid for 4-toluic acid in Example 329B.

[1217] MS(ESI) m/z 404 (M+H)+;

[1218] 1H NMR (500 MHz, CD3OD) δ 7.89 (m, 1H), 7.80 (s, 1H), 7.62 (m, 1H), 7.53 (m, 1H), 4.46 (d, 0.3H), 4.38 (d, 0.7H), 3.69 (m, 1H), 1.85-1.65 (m, 6H), 1.57 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 347

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-phenoxybenzohydrazide

[1219] The desired compound was prepared by substituting 4-phenoxybenzoic acid for 4-toluic acid in Example 329B.

[1220] MS(ESI) m/z 412 (M+H)+;

[1221] 1H NMR (500 MHz, CD3OD) δ 7.89 (m, 2H), 7.42 (m, 2H), 7.21 (m, 1H), 7.07 (m, 2H), 7.03 (m, 2H), 4.44 (d, 0.3H), 4.37 (d, 0.7H), 3.69 (m, 1H), 1.85-1.64 (m, 6H), 1.56 (m, 1H), 1.46 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 348

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,4-dimethylbenzohydrazide

[1222] The desired compound was prepared by substituting 2,4-dimethylbenzoic acid for 4-toluic acid in Example 329B.

[1223] MS(ESI) m/z 348 (M+H)+;

[1224] 1H NMR (500 MHz, CD3OD) δ 7.41 (dd, 1H), 7.12 (s, 1H), 7.09 (m, 1H), 4.43 (d, 0.25H), 4.36 (d, 0.75H), 3.70 (m, 0.75H), 3.66 (m, 0.25H), 2.43 (s, 3H), 2.34 (s, 3H), 1.85-1.65 (m, 6H), 1.57 (m, 1H), 1.46 (m, 1H), 1.32 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.5H), 0.92 (m, 0.5H).

EXAMPLE 349

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,5-dimethylbenzohydrazide

[1225] The desired compound was prepared by substituting 1,5-dimethylbenzoic acid for 4-toluic acid in Example 329B.
[1226] MS(ESI) m/e 348 (M+H)^+.

[1227] H NMR (500 MHz, CD3OD) δ 7.33 (s, 1H), 7.21 (m, 1H), 7.17 (m, 1H), 4.44 (d, 0.3H), 4.36 (d, 0.7H), 3.70 (m, 0.7H), 3.66 (m, 0.3H), 2.41 (s, 3H), 2.34 (s, 3H), 1.85-1.65 (m, 6H), 1.57 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 350

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutyranoyl)-3,4-dimethylbenzohydrazide

[1228] The desired compound was prepared by substituting 3,4-dimethylbenzoic acid for o-toluic acid in Example 329B.

[1229] MS(ESI) m/e 348 (M+H)^+.

[1230] H NMR (500 MHz, CD3OD) δ 7.66 (s, 1H), 7.62 (dd, 1H), 7.26 (dd, 1H), 4.44 (d, 0.3H), 4.36 (d, 0.7H), 3.68 (m, 1H), 2.07 (s, 6H), 1.85-1.65 (m, 6H), 1.56 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 351

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutyranoyl)-3,5-dimethylbenzohydrazide

[1231] The desired compound was prepared by substituting 3,5-dimethylbenzoic acid for o-toluic acid in Example 329B.

[1232] MS(ESI) m/e 348 (M+H)^+.

[1233] H NMR (500 MHz, CD3OD) δ 7.50 (s, 1H), 7.26 (s, 0.75H), 7.24 (s, 0.25H), 4.44 (d, 0.25H), 4.36 (d, 0.75H), 3.68 (m, 1H), 2.37 (s, 6H), 1.85-1.65 (m, 6H), 1.55 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.03 (m, 1.5H), 0.92 (m, 0.5H).

EXAMPLE 352

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutyranoyl)-2,3-dimethoxybenzohydrazide

[1234] The desired compound was prepared by substituting 2,3-dimethoxybenzoic acid for o-toluic acid in Example 329B.

[1235] MS(ESI) m/e 380 (M+H)^+.

[1236] H NMR (500 MHz, CD3OD) δ 7.41 (m, 1H), 7.24 (td, 2H), 7.19 (td, 1H), 4.44 (d, 0.3H), 4.37 (d, 0.7H), 3.95 (s, 2.1H), 3.95 (s, 0.9H), 3.91 (s, 2.1H), 3.90 (s, 0.9H), 3.69 (m, 1H), 1.85-1.65 (m, 6H), 1.57 (m, 1H), 1.46 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 353

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutyranoyl)-3,4-dimethoxybenzohydrazide

[1237] The desired compound was prepared by substituting 3,4-dimethoxybenzoic acid for o-toluic acid in Example 329B.

[1238] MS(ESI) m/e 380 (M+H)^+.

[1239] H NMR (500 MHz, CD3OD) δ 7.55 (m, 1H), 7.50 (d, 1H), 7.05 (dd, 1H), 4.44 (d, 0.3H), 4.37 (d, 0.7H), 3.90 (s, 3H), 3.88 (s, 3H), 3.69 (m, 1H), 1.85-1.65 (m, 6H), 1.57 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 354

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutyranoyl)-3,4,5-trimethoxybenzohydrazide

[1240] The desired compound was prepared by substituting 3,4,5-trimethoxybenzoic acid for o-toluic acid in Example 329B.

[1241] MS(ESI) m/e 410 (M+H)^+.

[1242] H NMR (500 MHz, CD3OD) δ 7.25 (s, 1H), 4.46 (d, 0.3H), 4.37 (d, 0.7H), 3.89 (s, 6H), 3.83 (s, 3H), 3.69 (m, 1H), 1.85-1.65 (m, 6H), 1.57 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 355

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutyranoyl)-2,3-dichlorobenzohydrazide

[1243] The desired compound was prepared by substituting 2,3-dichlorobenzoic acid for o-toluic acid in Example 329B.

[1244] MS(ESI) m/e 389 (M+H)^+.

[1245] H NMR (500 MHz, CD3OD) δ 7.68 (d, 1H), 7.54 (d, 1H), 6.42 (td, 1H), 4.44 (d, 0.3H), 4.36 (d, 0.7H), 3.69 (m, 1H), 1.85-1.65 (m, 6H), 1.55 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 356

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutyranoyl)-2,4-dichlorobenzohydrazide

[1246] The desired compound was prepared by substituting 2,4-dichlorobenzoic acid for o-toluic acid in Example 329B.

[1247] MS(ESI) m/e 389 (M+H)^+.

[1248] H NMR (500 MHz, CD3OD) δ 7.60 (m, 2H), 7.46 (m, 1H), 4.44 (d, 0.31H), 4.35 (d, 0.7H), 3.68 (m, 1H), 1.85-1.65 (m, 6H), 1.55 (m, 1H), 1.46 (m, 1H), 1.33 (m, 2H), 1.23 (m, 1H), 1.02 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 357

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutyranoyl)-3,4-dichlorobenzohydrazide

[1249] The desired compound was prepared by substituting 3,4-dichlorobenzoic acid for o-toluic acid in Example 329B.

[1250] MS(ESI) m/e 389 (M+H)^+.

[1251] H NMR (500 MHz, CD3OD) δ 8.05 (m, 1H), 7.80 (m, 1H), 7.68 (m, 1H), 4.45 (d, 0.3H), 4.37 (d, 0.7H), 3.67 (m, 1H), 1.85-1.65 (m, 6H), 1.56 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.4H), 0.92 (m, 0.6H).
EXAMPLE 358

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3,5-dichlorobenzohydrazide

[1252] The desired compound was prepared by substituting 3,5-dichlorobenzoic acid for o-toluic acid in Example 329B.

[1253] MS(ESI) m/e 389 (M+H)+;

[1254] 1H NMR (500 MHz, CD3OD) δ 7.97-7.69 (m, 3H), 4.45 (d, 0.3H), 4.37 (d, 0.7H), 3.68 (m, 1H), 1.85-1.65 (m, 6H), 1.56 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 359

N’-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,3-dimethylbenzohydrazide

[1255] The desired compound was prepared by substituting 2,3-dimethylbenzoic acid for o-toluic acid in Example 329B.

[1256] MS(ESI) m/e 348 (M+H)+;

[1257] 1H NMR (500 MHz, CD3OD) δ 7.60 (m, 1H), 6.44 (d, 0.3H), 4.38 (d, 0.7H), 3.68 (m, 1H), 1.85-1.64 (m, 6H), 1.57 (m, 1H), 1.47 (m, 1H), 1.33 (m, 2H), 1.24 (m, 1H), 1.02 (m, 1.4H), 0.92 (m, 0.6H).

EXAMPLE 360

N’-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-benzenesulfonohydrazide

[1258] The desired product was prepared by substituting benzenesulfonohydrazide for O-phenyl hydroxylamine hydrochloride in Example 98B.

[1259] MS(ESI) m/e 348 (M+H)+;

[1260] 1H NMR (300 MHz, DMSO-d6) δ 7.38 (m, 5H), 6.68 (d, 0.6H), 6.62 (d, 0.4H), 4.30 (m, 0.4H), 4.14 (m, 0.6H), 3.87 (m, 1H), 2.60 (m, 2H), 2.45 (m, 2H), 1.64 (m, 1H), 1.36 (m, 1H), 1.16 (t, 3H).

EXAMPLE 361

N’-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-chlorobenzenesulfonohydrazide

[1261] The desired product was prepared by substituting 3-chlorobenzenesulfonohydrazide for O-phenyl hydroxylamine hydrochloride in Example 98B.

EXAMPLE 362

N’-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-1-naphthalenesulfonohydrazide

[1262] The desired product was prepared by substituting 1-naphthylsulfonohydrazide for O-phenyl hydroxylamine hydrochloride in Example 98B.

[1263] MS(ESI) m/e 398 (M+H)+;

[1264] 1H NMR (300 MHz, DMSO-d6) δ 10.25 (m, 1H), 8.70 (br s, 2H), 8.27 (m, 1H), 8.17 (m, 1H), 8.13 (m, 1H), 7.68 (m, 4H), 6.68 (d, 0.6H), 6.62 (d, 0.4H), 4.30 (m, 0.4H), 4.14 (m, 0.6H), 3.87 (m, 1H), 2.60 (m, 2H), 2.45 (m, 2H), 1.64 (m, 1H), 1.36 (m, 1H), 1.16 (t, 3H).

EXAMPLE 363

N’-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-methylbenzenesulfonohydrazide

[1265] The desired product was prepared by substituting 4-methylphenylsulfonohydrazide for O-phenyl hydroxylamine hydrochloride in

EXAMPLE 364

(2RS,3R)-3-amino-N’-(3-(2-aminoethoxy)phenyl)-2-hydroxy-5-(isopropylsulfanyl)pentanohydrazide

EXAMPLE 364A

N-(tert-butoxycarbonyl)-2-bromoethylamine

[1266] A solution of 2-bromoethylamine hydrobromide (1.0 g, 4.9 mmol), di-tert-butyl dicarbonate (1.06 g, 4.9 mmol) and triethylamine (0.7 mL, 4.9 mmol) in dichloromethane (40 mL) was stirred at room temperature for 18 h. The reaction mixture was diluted with ether, washed with brine, dried (Na2SO4), and concentrated to give the title compound.

EXAMPLE 364B

3-(2-tert-butoxycarbonylamino)ethoxy)benzoyl hydrazide

[1267] Example 364A, methyl-3-hydroxy-benzoate (1.09 g, 4.9 mmol) and potassium tert-butoxide (6.5 g, 58 mmol) in DMSO were stirred at room temperature for 16 hours. The reaction was poured into ice water and extracted with ether, washed with brine, dried over Na2SO4, evaporated, and treated with hydrazine hydrate in ethanol at reflux for 48 h. The reaction mixture was evaporated to dryness to give the title compound.

EXAMPLE 364C

(2RS,3R)-3-amino-N’-(3-(2-aminoethoxy)phenyl)-2-hydroxy-5-(isopropylsulfanyl)pentanohydrazide

[1268] The desired product was prepared by substituting Example 364A for O-phenyl hydroxylamine hydrochloride and Example 125B for Example 98A in Example 98B.

[1269] MS(ESI) m/e 383 (M-H)+.

[1270] 1H NMR (300 MHz, DMSO-d6) δ 10.6 & 10.42 (s, 1H), 10.25 & 10.12 (s, 1H), 8.15 & 8.04 (br s, 2H), 7.56-7.33 (m, 3H), 7.2 (m, 1H), 6.67 & 6.59 (br s, 1H), 4.45 & 4.24 (m, 3H), 3.25 (m, 2H), 3.0-2.9 (m, 1H), 2.75-2.55 (m, 2H), 2.68-2.0 (m, 2H), 1.3 (m, 6H).

EXAMPLE 365

N’-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-bromobenzyohydrazide

[1271] The desired product was prepared by substituting 3-bromobenzoic acid for 3-(ethylsulfanyl)benzoic acid in Example 239B.
[1272] MS(ESI) m/e 391 (M+H)+

[1273] 1H NMR (500 MHz, CD3OD) δ 8.06 (dd, 1H), 7.85 (dd, 1H), 7.77 (dd, 1H), 7.44 (m, 1H), 4.49 (d, 0.35), 4.44 (d, 0.65), 3.78 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (dd, 1H), 1.99 (dt, 1H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

EXEMPLARY 366

N'-(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxypentanoyl)-3-cyanobenzohydrazide

[1274] The desired product was prepared by substituting 2-cyanobenzoic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1275] MS(ESI) m/e 337 (M+H)+

[1276] 1H NMR (500 MHz, CD3OD) δ 8.23 (dd, 1H), 8.16 (dd, 1H), 7.96 (dd, 1H), 7.71 (m, 1H), 4.50 (d, 0.35), 4.45 (d, 0.65), 3.79 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (dd, 1H), 2.00 (dt, 1H), 1.28 (t, 1.95H), 1.25 (t, 1.05H).

EXEMPLARY 367

N'-(2RS,3R)-3-amino-5-(ethylsulfonyl)-2-hydroxypentanoyl)-3-cyanobenzohydrazide

[1277] The desired product was prepared by substituting 4-cyanobenzoic acid for 3-(ethylsulfonyl)benzoic acid in Example 239B.

[1278] MS(ESI) m/e 337 (M+H)+

[1279] 1H NMR (500 MHz, CD3OD) δ 8.02 (m, 2H), 7.88 (m, 2H), 4.50 (d, 0.35), 4.45 (d, 0.65), 3.79 (m, 1H), 2.71 (t, 2H), 2.61 (dd, 2H), 2.17 (dd, 1H), 2.00 (dt, 1H), 1.27 (t, 1.95H), 1.25 (t, 1.05H).

EXEMPLARY 368

N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)pentanoyl)-3-cyanobenzohydrazide

[1280] The title compound is obtained by substituting 3-cyanobenzohydrazide for O-phenylhydroxylamine hydrochloride and Example 123B for Example 98A in Example 98B.

[1281] MS(ESI) m/e 340 (M-H)-

[1282] 1H NMR (300 MHz, DMSO-d6) δ 10.44 & 10.26 (s, 1H), 10.17 & 10.06 (s, 1H), 9.78 & 9.74 (s, 1H), 8.05 & 8.97 (br s, 2H), 7.26 (m, 3H), 6.97 (m, 1H), 6.63 & 6.59 (dd, 1H), 4.38 & 4.22 (m, 1H), 3.7 & 3.6 (m, 1H), 3.0-2.9 (m, 1H), 2.75-2.55 (m, 2H), 2.05-1.77 (m, 2H), 1.2 (m, 6H).

EXEMPLARY 369

N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)pentanoyl)-2-methylbenzohydrazide

EXAMPLE 369A

N'-(2RS,3R)-3-(tert-butoxycarbonylamino)-5-(isopropylsulfonyl)-2-hydroxypentanoyl)-3-cyanobenzohydrazide

[1283] The desired compound was prepared by substituting Example 123B for Example 97A in Example 239A.

EXAMPLE 369B

N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)pentanoyl)-2-methylbenzohydrazide

[1284] To DCC resin (148 mg, 0.225 mmol) in 1.0 mL of dichloromethane was added 0.5 mL of a 0.45 M solution of HOBr (0.225 mmol) in dimethylacetamide/dichloromethane (1:6), and 0.5 mL of a 0.3M solution of o-tolualic acid (0.15 mmol) in dimethylacetamide. After 5 minutes, 1.0 mL of a 0.225 M solution of Example 369A (0.225 mmol) in dimethylacetamide/dichloromethane (1:1) was added. The mixture was agitated for 18 hours and quenched with 0.19 g of trimamine resin (0.75 mmol) followed by 0.13 g of isocyanate resin (0.225 mmol) and agitated for 4 hours. The mixture was filtered and the resins washed with 3x mL of dichloromethane, the solvent was removed in vacuo, and the crude material purified by reverse phase preparative HPLC. The resulting material was treated with 1 mL of 50% trifluoroacetic acid/dichloromethane and agitated at ambient temperature for 18 hours. The solvent was removed in vacuo to give the desired product.

[1285] MS(ESI) m/e 340 (M+H)+

[1286] 1H NMR (500 MHz, CD3OD) δ 7.50 (m, 1H), 7.40 (dd, 1H), 7.28 (m, 2H), 4.49 (d, 0.3H), 4.44 (d, 0.7H), 3.79 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.47 (2s, 3H), 2.16 (m, 1H), 1.98 (m, 1H), 1.29-1.25 (m, 6H).

EXEMPLARY 370

N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)pentanoyl)-3-methylbenzohydrazide

[1287] The desired compound was prepared by substituting m-tolualic acid for o-tolualic acid in Example 369.

[1288] MS(ESI) m/e 340 (M+H)+

[1289] 1H NMR (500 MHz, CD3OD) δ 7.69 (m, 2H), 7.40 (m, 2H), 4.49 (d, 0.3H), 4.44 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.41 (2s, 3H), 2.16 (m, 1H), 1.98 (m, 1H), 1.29-1.25 (m, 6H).

EXEMPLARY 371

N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)pentanoyl)-4-methylbenzohydrazide

[1290] The desired compound was prepared by substituting p-tolualic acid for o-tolualic acid in Example 369.

[1291] MS(ESI) m/e 340 (M+H)+

[1292] 1H NMR (500 MHz, CD3OD) δ 7.78 (m, 2H), 7.31 (m, 2H), 4.49 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.41 (2s, 3H), 2.15 (m, 1H), 1.99 (m, 1H), 1.29-1.24 (m, 6H).

EXEMPLARY 372

N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)pentanoyl)-2-methoxybenzohydrazide

[1293] The desired compound was prepared by substituting o-anisic acid for o-tolualic acid in Example 369.

[1294] MS(ESI) m/e 356 (M+H)+
EXAMPLE 373
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-methoxybenzohydrazide

[1296] The desired compound was prepared by substituting m-anisic acid for o-toluic acid in Example 369.

[1297] MS(ESI) m/e 356 (M+H)+;

[1298] 1H NMR (500 MHz, CD3OD) δ 7.99 (dd, 1H), 7.57 (m, 1H), 7.19 (m, 1H), 7.09 (m, 1H), 4.48 (d, 0.3H), 4.45 (d, 0.7H), 4.00 (s, 2H), 3.79 (s, 0.9H), 3.78 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.14 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

EXAMPLE 374
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-methoxybenzohydrazide

[1299] The desired compound was prepared by substituting p-anisic acid for o-toluic acid in Example 369.

[1300] MS(ESI) m/e 356 (M+H)+;

[1301] 1H NMR (500 MHz, CD3OD) δ 7.87 (m, 2H), 7.02 (m, 2H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.87 (s, 2H), 3.86 (s, 0.9H), 3.77 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.14 (m, 1H), 1.98 (m, 1H), 1.29-1.25 (m, 6H).

EXAMPLE 375
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-fluorobenzohydrazide

[1302] The desired compound was prepared by substituting o-fluorobenzoic acid for o-toluic acid in Example 369.

[1303] MS(ESI) m/e 344 (M+H)+;

[1304] 1H NMR (500 MHz, CD3OD) δ 7.81 (m, 1H), 7.60 (m, 1H), 7.33 (d, 1H), 7.27 (m, 1H), 4.48 (d, 0.3H), 4.43 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

EXAMPLE 376
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-fluorobenzohydrazide

[1305] The desired compound was prepared by substituting m-fluorobenzoic acid for o-toluic acid in Example 369.

[1306] MS(ESI) m/e 344 (M+H)+; 1H NMR (500 MHz, CD3OD) δ 7.72 (t, 1H), 7.62 (m, 1H), 7.53 (dd, 1H), 7.36 (dd, 1H), 4.49 (d, 0.3H), 4.44 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.16 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

EXAMPLE 377
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-fluorobenzohydrazide

[1307] The desired compound was prepared by substituting p-fluorobenzoic acid for o-toluic acid in Example 369.

[1308] MS(ESI) m/e 344 (M+H)+;

[1309] 1H NMR (500 MHz, CD3OD) δ 7.95 (m, 2H), 7.24 (m, 2H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.25 (m, 6H).

EXAMPLE 378
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-chlorobenzohydrazide

[1310] The desired compound was prepared by substituting o-chlorobenzoic acid for o-toluic acid in Example 369.

[1311] MS(ESI) m/e 360 (M+H)+;

[1312] 1H NMR (500 MHz, CD3OD) δ 7.61 (m, 1H), 7.50 (m, 2H), 7.42 (m, 1H), 4.48 (d, 0.3H), 4.43 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

EXAMPLE 379
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-chlorobenzohydrazide

[1313] The desired compound was prepared by substituting p-chlorobenzoic acid for o-toluic acid in Example 369.

[1314] MS(ESI) m/e 360 (M+H)+;

[1315] 1H NMR (500 MHz, CD3OD) δ 7.87 (m, 2H), 7.52 (m, 2H), 4.49 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

EXAMPLE 380
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-bromobenzohydrazide

[1316] The desired compound was prepared by substituting o-bromobenzoic acid for o-toluic acid in Example 369.

[1317] MS(ESI) m/e 405 (M+H)+;

[1318] 1H NMR (500 MHz, CD3OD) δ 7.69 (m, 1H), 7.59 (m, 1H), 7.46 (m, 1H), 7.42 (m, 1H), 4.48 (d, 0.3H), 4.43 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

EXAMPLE 381
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-bromobenzohydrazide

[1319] The desired compound was prepared by substituting 3-bromobenzoic acid for o-toluic acid in Example 369.

[1320] MS(ESI) m/e 405 (M+H)+;

[1321] 1H NMR (500 MHz, CD3OD) δ 8.06 (d, 1H), 7.85 (m, 1H), 7.77 (m, 1H), 7.74 (m, 1H), 4.49 (d, 0.3H), 4.44 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

EXAMPLE 382
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-bromobenzohydrazide

[1322] The desired compound was prepared by substituting 4-bromobenzoic acid for o-toluic acid in Example 369.
[1323] MS(ESI) m/e 405 (M+H)+;
[1324] 1H NMR (500 MHz, CD3OD) δ 7.80 (m, 2H), 7.68 (m, 2H), 4.49 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

EXAMPLE 383

N’-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2,3-dichlorobenzoxohydrazide

[1325] The desired compound was prepared by substituting 2, 3-dichlorobenzoic acid for o-toluic acid in Example 369.

[1326] MS(ESI) m/e 395 (M+H)+;
[1327] 1H NMR (500 MHz, CD3OD) δ 7.69 (t, 1H), 7.53 (m, 1H), 7.42 (m, 1H), 4.49 (d, 0.3H), 4.43 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

EXAMPLE 384

(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)-N’-(tetrahydro-2-furanylcobonyl)pentanoylhydrazide

[1328] The desired compound was prepared by substituting tetrahydrofuran-2-carboxylic acid for o-toluic acid in Example 369.

[1329] MS(ESI) m/e 320 (M+H)+;
[1330] 1H NMR (500 MHz, CD3OD) δ 4.45 (m, 1.3H), 4.38 (d, 0.7H), 4.02 (m, 1H), 3.87 (m, 1H), 3.73 (m, 1H), 2.98 (m, 1H), 2.69 (t, 2H), 2.29 (m, 1H), 2.10 (m, 2H), 1.94 (m, 3H), 1.28-1.23 (m, 6H).

EXAMPLE 385

(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)-N’-(tetrahydro-2-furanylcobonyl)pentanoylhydrazide

[1331] The desired compound was prepared by substituting tetrahydro-3-furic acid for o-toluic acid in Example 369.

[1332] MS(ESI) m/e 320 (M+H)+;
[1333] 1H NMR (500 MHz, CD3OD) δ 4.42 (d, 0.3H), 4.38 (d, 0.7H), 3.96 (m, 1H), 3.88 (m, 2H), 3.79 (m, 1H), 3.72 (m, 1H), 3.10 (m, 1H), 2.98 (m, 1H), 2.69 (t, 2H), 2.13 (m, 3H), 1.94 (m, 1H), 1.28-1.23 (m, 6H).

EXAMPLE 386

(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)-N’-cyclopentylpentanoylhydrazide

[1334] The desired compound was prepared by substituting cyclopentanecarboxylic acid for o-toluic acid in Example 369.

[1335] MS(ESI) m/e 318 (M+H)+;
[1336] 1H NMR (500 MHz, CD3OD) δ 4.41 (d, 0.3H), 4.37 (d, 0.7H), 3.72 (m, 1H), 2.98 (m, 1H), 2.70 (m, 2H), 2.11(m, 1H), 2.10 (m, 1H), 1.91 (m, 3H), 1.77 (m, 5H), 1.62 (m, 1H), 1.28-1.23 (m, 6H).

EXAMPLE 387

N’-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-cyclopentylacetohydrazide

[1337] The desired compound was prepared by substituting cyclopentylacetic acid for o-toluic acid in Example 369.

[1338] MS(ESI) m/e 332 (M+H)+;
[1339] 1H NMR (500 MHz, CD3OD) δ 4.41 (d, 0.3H), 4.37 (d, 0.7H), 3.72 (m, 1H), 2.98 (m, 1H), 2.69 (t, 2H), 2.27 (m, 3H), 2.10 (m, 1H), 1.94 (m, 1H), 1.85 (m, 2H), 1.67 (m, 2H), 1.58 (m, 2H), 1.28-1.23 (m, 8H).

EXAMPLE 388

(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)-N’-cyclohexylpentanoylhydrazide

[1340] The desired compound was prepared by substituting cyclohexanecarboxylic acid for o-toluic acid in Example 369.

[1341] MS(ESI) m/e 332 (M+H)+;
[1342] 1H NMR (500 MHz, CD3OD) δ 4.41 (d, 0.3H), 4.37 (d, 0.7H), 3.72 (m, 1H), 2.98 (m, 1H), 2.69 (t, 2H), 2.30 (m, 1H), 2.10 (m, 1H), 1.94 (m, 1H), 1.82 (m, 4H), 1.71 (m, 1H), 1.48 (m, 2H), 1.37-1.23 (m, 9H).

EXAMPLE 389

N’-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-cyclohexylacetohydrazide

[1343] The desired compound was prepared by substituting cyclohexylacetic acid for o-toluic acid in Example 369.

[1344] MS(ESI) m/e 346 (M+H)+;
[1345] 1H NMR (500 MHz, CD3OD) δ 4.41 (d, 0.3H), 4.36 (d, 0.7H), 3.72 (m, 1H), 2.98 (m, 1H), 2.69 (t, 2H), 2.12 (m, 3H), 1.94 (m, 1H), 1.74 (m, 6H), 1.26 (m, 9H), 1.02 (m, 2H).

EXAMPLE 390

N’-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-furohydrazide

[1346] The desired compound was prepared by substituting furan-2-carboxylic acid for o-toluic acid in Example 369.

[1347] MS(ESI) m/e 310(M+H)+;
[1348] 1H NMR (500 MHz, CD3OD) δ 7.74 (d, 0.7H), 7.72 (d, 0.3H), 7.24 (d, 0.7H), 7.21 (d, 0.3H), 6.64 (m, 1H), 4.47 (d, 0.3H), 4.43 (d, 0.7H), 3.77 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.14 (m, 1H), 1.97 (m, 1H), 1.28-1.23 (m, 6H).

EXAMPLE 391

N’-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-furohydrazide

[1349] The desired compound was prepared by substituting furan-3-carboxylic acid for o-toluic acid in Example 369.

[1350] MS(ESI) m/e 316 (M+H)+;
[1351] $^1$H NMR (500 MHz, CD$_3$OD) $\delta$ 8.17 (d, 0.7H), 8.14 (d, 0.3H), 7.62 (m, 1H), 6.83 (m, 1H), 4.47 (d, 0.3H), 4.43 (d, 0.7H), 3.75 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.14 (m, 1H), 1.97 (m, 1H), 1.28-1.23 (m, 6H).

**EXAMPLE 392**

N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanylpentanoyl)-2,5-dimethyl-3-furohydrazide

[1352] The desired compound was prepared by substituting 2,5-dimethyl-3-furoic acid for toluate acid in Example 369.

[1353] MS(ESI) m/e 344 (M+H)$^+$

[1354] $^1$H NMR (500 MHz, CD$_3$OD) $\delta$ 6.32 (s, 0.7H), 6.31 (d, 0.3H), 4.46 (d, 0.3H), 4.41 (d, 0.7H), 3.75 (m, 1H), 3.00 (m, 1H), 2.70 (t, 2H), 2.50 (s, 3H), 2.25 (s, 3H), 2.14 (m, 1H), 1.97 (m, 1H), 1.28-1.23 (m, 6H).

**EXAMPLE 393**

N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanylpentanoyl)-2-thiophenecarboxyhydrazide

[1355] The desired compound was prepared by substituting thiophene-2-carboxylic acid for toluate acid in Example 369.

[1356] MS(ESI) m/e 332 (M+H)$^+$

[1357] $^1$H NMR (500 MHz, CD$_3$OD) $\delta$ 7.77 (m, 2H), 7.17 (m, 1H), 4.48 (d, 0.3H), 4.43 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.14 (m, 1H), 1.97 (m, 1H), 1.29-1.25 (m, 6H).

**EXAMPLE 394**

N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanylpentanoyl)-3-thiophene-carboxyhydrazide

[1358] The desired compound was prepared by substituting thiophene-3-carboxylic acid for toluate acid in Example 369.

[1359] MS(ESI) m/e 332 (M+H)$^+$

[1360] $^1$H NMR (500 MHz, CD$_3$OD) $\delta$ 8.19 (m, 0.7H), 8.16 (m, 0.3H), 7.54 (m, 2H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.14 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

**EXAMPLE 395**

N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanylpentanoyl)-3-methyl-2-thiophenecarboxyhydrazide

[1361] The desired compound was prepared by substituting 3-methylthiophene-2-carboxylic acid for toluate acid in Example 369.

[1362] MS(ESI) m/e 346 (M+H)$^+$

[1363] $^1$H NMR (500 MHz, CD$_3$OD) $\delta$ 7.56 (d, 0.7H), 7.53 (d, 0.3H), 6.99 (m, 1H), 4.47 (d, 0.3H), 4.43 (d, 0.7H), 3.77 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.51 (s, 2H), 2.50 (s, 0.9H), 2.14 (m, 1H), 1.97 (m, 1H), 1.29-1.24 (m, 6H).

**EXAMPLE 396**

N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanylpentanoyl)-5-methyl-2-thiophenecarboxyhydrazide

[1364] The desired compound was prepared by substituting 5-methylthiophene-2-carboxylic acid for toluate acid in Example 369.

[1365] MS(ESI) m/e 346 (M+H)$^+$

[1366] $^1$H NMR (500 MHz, CD$_3$OD) $\delta$ 7.61 (d, 0.7H), 7.58 (d, 0.3H), 6.86 (m, 1H), 4.46 (d, 0.3H), 4.42 (d, 0.7H), 3.76 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.53 (s, 3H), 2.14 (m, 1H), 1.97 (m, 1H), 1.28-1.24 (m, 6H).

**EXAMPLE 397**

N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanylpentanoyl)-1-H-pyrrole-2-carboxyhydrazide

[1367] The desired compound was prepared by substituting pyrrole-2-carboxylic acid for toluate acid in Example 369.

[1368] MS(ESI) m/e 315 (M+H)$^+$

[1369] $^1$H NMR (500 MHz, CD$_3$OD) $\delta$ 7.99 (m, 1H), 6.90 (m, 1H), 6.21 (m, 1H), 4.43 (d, 0.3H), 4.42 (d, 0.7H), 3.76 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.13 (m, 1H), 1.97 (m, 1H), 1.29-1.25 (m, 6H).

**EXAMPLE 398**

N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanylpentanoyl)-1-methyl-1-H-pyrrole-2-carboxyhydrazide

[1370] The desired compound was prepared by substituting 1-methylpyrrole-2-carboxylic acid for toluate acid in Example 369.

[1371] MS(ESI) m/e 329 (M+H)$^+$

[1372] $^1$H NMR (500 MHz, CD$_3$OD) $\delta$ 6.90 (m, 2H), 6.10 (m, 1H), 4.45 (d, 0.3H), 4.42 (d, 0.7H), 3.89 (s, 3H), 3.76 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.14 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

**EXAMPLE 399**

N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanylpentanoyl)-1,3-thiazole-2-carboxyhydrazide

[1373] The desired compound was prepared by substituting thiazole-2-carboxylic acid for toluate acid in Example 369.

[1374] MS(ESI) m/e 333 (M+H)$^+$

[1375] $^1$H NMR (500 MHz, CD$_3$OD) $\delta$ 8.02 (d, 0.6H), 8.00 (d, 0.4H), 7.94 (d, 0.6H), 7.92 (d, 0.4H), 4.49 (d, 0.4H), 4.44 (d, 0.6H), 3.78 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.15 (m, 1H), 1.97 (m, 1H), 1.29-1.26 (m, 6H).

**EXAMPLE 400**

N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanylpentanoyl)-1,3-thiazole-4-carboxyhydrazide

[1376] The desired compound was prepared by substituting thiazole-4-carboxylic acid for toluate acid in Example 369.
EXAMPLE 401

N’-(2RS,3R)-3-amino-2-hydroxy-5-isopropylpentanoyl)-2-pyridinecarboxhydrazide

The desired compound was prepared by substituting pyridine-2-carboxylic acid for o-toluic acid in Example 369.

EXAMPLE 402

N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-6-chloro-2H-chromene-3-carboxyhydrazide

The desired compound was prepared by substituting 6-chloro(2H)-1-benzopyran-3-carboxylic acid for o-toluic acid in Example 369.

EXAMPLE 403

N’-(2RS,3R)-3-amino-2-hydroxy-7-(isopropylsulfanyl)pentanoyl)-2-(4-morpholinyl)acetohydrazide

The desired compound was prepared by substituting 1-morpholineacetic acid for o-toluic acid in Example 369.

EXAMPLE 404

N’-(2RS,3R)-3-amino-2-hydroxy-7-(isopropylsulfanyl)pentanoyl)-2-(4-methyl-1-piperazinyi)acetohydrazide

The desired compound was prepared by substituting 4-N-methylpiperazine-1-acetic acid for o-toluic acid in Example 369.

EXAMPLE 405

1-acetyl-N’-(2RS,3R)-3-amino-2-hydroxy-7-(isopropylsulfanyl)pentanoyl)-4-piperidinecarboxhydrazide

The desired compound was prepared by substituting 1-acetylpyridine-4-carboxylic acid for o-toluic acid in Example 369.

EXAMPLE 406

N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-ethylbenzohydrazide

The desired compound was prepared by substituting 4-ethylbenzoic acid for o-toluic acid in Example 369.

EXAMPLE 407

N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-fluoro-2-methylbenzohydrazide

The desired compound was prepared by substituting 3-fluoro-2-methylbenzoic acid for o-toluic acid in Example 369.

EXAMPLE 408

N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2,3-difluorobenzohydrazide

The desired compound was prepared by substituting 2,3-difluorobenzoic acid for o-toluic acid in Example 369.

EXAMPLE 409

N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-propylbenzohydrazide

The desired compound was prepared by substituting 4-N-propylbenzoic acid for o-toluic acid in Example 369.

EXAMPLE 410

N’-(2RS,3R)-3-amino-2-hydroxy-7-(isopropylsulfanyl)pentanoyl)-4-piperidinecarboxhydrazide

The desired compound was prepared by substituting 1-acetylpyridine-4-carboxylic acid for o-toluic acid in Example 369.
EXAMPLE 410

N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-isopropylbenzohydrazide

[1406] The desired compound was prepared by substituting 4-isopropylbenzoic acid for o-toluic acid in Example 369.

[1407] MS(ESI) m/z 368 (M+H)^+;  

[1408] 1H NMR (500 MHz, CD3OD) δ 7.82 (m, 1H), 7.38 (m, 2H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 2H), 2.72 (t, 2H), 0.30 (m, 1H), 2.15 (m, 1H), 1.98 (m, 1H), 1.68 (m, 2H), 1.29-1.24 (m, 6H), 0.95 (t, 1H).

EXAMPLE 411

N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-ethoxybenzohydrazide

[1409] The desired compound was prepared by substituting 2-ethoxybenzoic acid for o-toluic acid in Example 369.

[1410] MS(ESI) m/z 370 (M+H)^+;  

[1411] 1H NMR (500 MHz, CD3OD) δ 7.97 (m, 1H), 7.54 (m, 1H), 7.18 (m, 1H), 7.09 (t, 1H), 4.49 (d, 0.3H), 4.44 (d, 0.7H), 4.29 (q, 2H), 3.78 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.15 (m, 1H), 1.97 (m, 1H), 1.51 (t, 3H), 1.29-1.24 (m, 6H).

EXAMPLE 412

N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-ethoxybenzohydrazide

[1412] The desired compound was prepared by substituting 4-ethoxybenzoic acid for o-toluic acid in Example 369.

[1413] MS(ESI) m/z 370 (M+H)^+;  

[1414] 1H NMR (500 MHz, CD3OD) δ 7.85 (m, 1H), 6.99 (m, 1H), 7.31 (m, 1H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 4.12 (q, 2H), 3.77 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.41 (t, 3H), 1.29-1.24 (m, 6H).

EXAMPLE 413

N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-1-naphthohydrazide

[1415] The desired compound was prepared by substituting 1-naphthoic acid for o-toluic acid in Example 369.

[1416] MS(ESI) m/z 376 (M+H)^+;  

[1417] 1H NMR (500 MHz, CD3OD) δ 7.38 (m, 1H), 8.04 (t, 1H), 7.95 (m, 1H), 7.77 (t, 1H), 7.56 (m, 3H), 4.53 (d, 0.3H), 4.49 (d, 0.7H), 3.84 (m, 1H), 3.02 (m, 1H), 2.74 (t, 2H), 2.19 (m, 1H), 2.01 (m, 1H), 1.31-1.24 (m, 6H).

EXAMPLE 414

N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-tert-butylbenzohydrazide

[1418] The desired compound was prepared by substituting 4-tet-butylbenzoic acid for o-toluic acid in Example 369.

[1419] MS(ESI) m/z 382 (M+H)^+;  

[1420] 1H NMR (500 MHz, CD3OD) δ 7.83 (m, 2H), 7.55 (m, 2H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.99 (m, 1H), 1.35 (s, 9H), 1.29-1.24 (m, 6H).

EXAMPLE 415

N-(4-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)hydrindeno(1,2-b)benzophenyl)(2-phenyl)acetamide

[1421] The desired compound was prepared by substituting 4-acetamidobenzoic acid for o-toluic acid in Example 369.

[1422] MS(ESI) m/z 383 (M+H)^+;  

[1423] 1H NMR (500 MHz, CD3OD) δ 7.86 (m, 2H), 7.71 (m, 2H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 4H), 1.97 (m, 1H), 1.29-1.24 (m, 6H).

EXAMPLE 416

N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-propoxybenzohydrazide

[1424] The desired compound was prepared by substituting p-propoxybenzoic acid for o-toluic acid in Example 369.

[1425] MS(ESI) m/z 384 (M+H)^+;  

[1426] 1H NMR (500 MHz, CD3OD) δ 7.85 (m, 2H), 7.00 (m, 2H), 7.31 (m, 1H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 4.01 (m, 2H), 3.78 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.15 (m, 1H), 1.97 (m, 1H), 1.82 (m, 2H), 1.29-1.24 (m, 6H), 1.05 (t, 3H).

EXAMPLE 417

N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-isopropoxybenzohydrazide

[1427] The desired compound was prepared by substituting 4-isopropoxybenzoic acid for o-toluic acid in Example 369.

[1428] MS(ESI) m/z 384 (M+H)^+;  

[1429] 1H NMR (500 MHz, CD3OD) δ 7.84 (m, 2H), 6.98 (m, 2H), 4.71 (m, 1H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.14 (m, 1H), 1.98 (m, 1H), 1.34 (d, 6H), 1.29-1.24 (m, 6H).

EXAMPLE 418

N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-5-chloro-2-methoxybenzohydrazide

[1430] The desired compound was prepared by substituting 5-chloro-2-methoxybenzoic acid for o-toluic acid in Example 369.

[1431] MS(ESI) m/z 390 (M+H)^+;  

[1432] 1H NMR (500 MHz, CD3OD) δ 7.92 (d, 0.7H), 7.89 (d, 0.3H), 7.55 (td, 1H), 7.20 (m, 1H), 4.47 (d, 0.3H),
EXAMPLE 419
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-(methylsulfonfyl)benzohydrazide

[1433] The desired compound was prepared by substituting 4-(methylsulfonfyl)benzocid acid for o-toluic acid in Example 369.

[1434] MS(ESI) m/e 404 (M+H)+

[1435] 1H NMR (500 MHz, CD3OD) δ 8.10 (s, 2H), 8.09 (s, 1H), 4.61 (d, 0.3H), 4.46 (d, 0.7H), 3.78 (m, 1H), 3.17 (s, 2H), 3.17 (s, 1H), 3.01 (m, 1H), 2.72 (m, 1H), 2.16 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

EXAMPLE 420
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-chloro-5-(methylsulfanyl)benzohydrazide

[1436] The desired compound was prepared by substituting 2-chloro-5-(methylthio)benzocid acid for o-toluic acid in Example 369.

[1437] MS(ESI) m/e 406 (M+H)+

[1438] 1H NMR (500 MHz, CD3OD) δ 7.49 (d, 1H), 7.43-7.35 (m, 2H), 4.48 (d, 0.3H), 4.43 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.52 (s, 1H), 2.15 (m, 1H), 1.97 (m, 1H), 1.29-1.24 (m, 6H).

EXAMPLE 421
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3,4-dithioxobenzohydrazide

[1439] The desired compound was prepared by substituting 3,4-dithioxobenzocid acid for o-toluic acid in Example 369.

[1440] MS(ESI) m/e 414 (M+H)+

[1441] 1H NMR (500 MHz, CD3OD) δ 7.51 (m, 1H), 7.48 (m, 1H), 7.02 (m, 1H), 4.47 (d, 0.3H), 4.44 (d, 0.7H), 4.12 (m, 4H), 3.77 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.43 (m, 6H), 1.29-1.24 (m, 6H).

EXAMPLE 422
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-benzyloenzohydrazide

[1442] The desired compound was prepared by substituting alpha-phenyl-o-toluic acid for o-toluic acid in Example 369.

[1443] MS(ESI) m/e 416 (M+H)+

[1444] 1H NMR (500 MHz, CD3OD) δ 7.54 (t, 1H), 7.40 (m, 1H), 7.29 (t, 1H), 7.23 (m, 5H), 7.16 (m, 1H), 4.49 (d, 0.3H), 4.43 (d, 0.7H), 4.19 (m, 1H), 3.78 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.15 (m, 1H), 1.97 (m, 1H), 1.29-1.19 (m, 6H).

EXAMPLE 423
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-aniinobenzohydrazide

[1445] The desired compound was prepared by substituting N-phenylanthramic acid for o-toluic acid in Example 369.

[1446] MS(ESI) m/e 417 (M+H)+

[1447] 1H NMR (500 MHz, CD3OD) δ 7.68 (m, 1H), 7.32 (m, 4H), 7.16 (d, 2H), 7.02 (m, 1H), 6.83 (m, 1H), 4.49 (d, 0.3H), 4.44 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.16 (m, 1H), 1.98 (m, 1H), 1.28-1.19 (m, 6H).

EXAMPLE 424
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-(2-phenylethyl)benzohydrazide

[1448] The desired compound was prepared by substituting 2-phenylcarboxylic acid for o-toluic acid in Example 369.

[1449] MS(ESI) m/e 430 (M+H)+

[1450] 1H NMR (500 MHz, CD3OD) δ 7.53 (m, 1H), 7.40 (m, 1H), 7.28 (m, 4H), 7.23 (d, 4H), 7.15 (m, 1H), 4.50 (d, 0.3H), 4.45 (d, 0.7H), 3.81 (m, 1H), 3.10 (m, 2H), 3.01 (m, 1H), 2.93 (m, 2H), 2.72 (t, 2H), 2.17 (m, 1H), 1.99 (m, 1H), 1.29-1.20 (m, 6H).

EXAMPLE 425
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(methylsulfanyl)benzohydrazide

[1451] The desired compound was prepared by substituting 3-(methylthio)benzocid acid for o-toluic acid in Example 369.

[1452] MS(ESI) m/e 372 (M+H)+

[1453] 1H NMR (500 MHz, CD3OD) δ 7.77 (m, 1H), 7.63 (m, 1H), 7.48 (m, 1H), 7.42 (m, 1H), 4.49 (d, 0.3H), 4.45 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.53 (s, 3H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

EXAMPLE 426
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(ethylsulfanyl)benzohydrazide

[1454] The desired compound was prepared by substituting 3-(ethylthio)benzocid acid for o-toluic acid in Example 369.

[1455] MS(ESI) m/e 386 (M+H)+

[1456] 1H NMR (500 MHz, CD3OD) δ 7.83 (m, 1H), 7.67 (m, 1H), 7.54 (m, 1H), 7.43 (m, 1H), 4.49 (d, 0.31H), 4.45 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 3H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.33-1.25 (m, 9H).

EXAMPLE 427
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(propylsulfanyl)benzohydrazide

[1457] The desired compound was prepared by substituting 3-(propylthio)benzocid acid for o-toluic acid in Example 369.
[1458] MS(ESI) m/e 400 (M+H)+

[1459] 1H NMR (500 MHz, CD3OD) δ 7.83 (m, 1H), 7.66 (t, 1H), 7.54 (m, 1H), 7.42 (m, 1H), 4.49 (d, 0.3H), 4.45 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 3H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.68 (m, 2H), 1.29-1.24 (m, 6H), 1.04 (t, 3H).

EXAMPLE 428

N-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(butylsulfanyl)benzohydrazide

[1460] The desired compound was prepared by substituting 3-(butylthio)benzoyl acid for o-toluic acid in Example 369.

[1461] MS(ESI) m/e 414 (M+H)+

[1462] 1H NMR (500 MHz, CD3OD) δ 7.83 (m, 1H), 7.66 (t, 1H), 7.54 (t, 1H), 7.42 (m, 1H), 4.49 (d, 0.3H), 4.45 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 3H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.64 (m, 2H), 1.49 (m, 2H), 1.29-1.24 (m, 6H), 0.94 (t, 3H)

EXAMPLE 429

N-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(hexylsulfanyl)benzohydrazide

[1463] The desired compound was prepared by substituting 3-(hexylthio)benzoyl acid for o-toluic acid in Example 369.

[1464] MS(ESI) m/e 442 (M+H)+

[1465] 1H NMR (500 MHz, CD3OD) δ 7.83 (m, 1H), 7.66 (t, 1H), 7.54 (m, 1H), 7.42 (m, 1H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 3H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.65 (m, 2H), 1.46 (m, 2H), 1.32-1.24 (m, 1OH), 0.90 (t, 3H)

EXAMPLE 430

N-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(pentylsulfanyl)benzohydrazide

[1466] The desired compound was prepared by substituting 3-(isopropylthio)benzoyl acid for o-toluic acid in Example 369.

[1467] MS(ESI) m/e 400 (M+H)+

[1468] 1H NMR (500 MHz, CD3OD) δ 7.90 (m, 1H), 7.73 (m, 1H), 7.61 (m, 1H), 7.45 (m, 1H), 4.49 (d, 0.3H), 4.45 (d, 0.7H), 3.78 (m, 1H), 3.51 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.30-1.24 (m, 12H)

EXAMPLE 431

N-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(isobutylsulfanyl)benzohydrazide

[1469] The desired compound was prepared by substituting 3-(2-methylpropylthio)benzoyl acid for o-toluic acid in Example 369.

[1470] MS(ESI) m/e 414 (M+H)+

[1471] 1H NMR (500 MHz, CD3OD) δ 7.84 (m, 1H), 7.65 (m, 1H), 7.54 (m, 1H), 7.42 (m, 1H), 4.49 (d, 0.3H), 4.45 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.90 (d, 2H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.86 (m, 1H), 1.29-1.24 (m, 6H), 1.05 (d, 6H).

EXAMPLE 432

N-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(4-(methylpentyl)sulfanyl)benzohydrazide

[1472] The desired compound was prepared by substituting 3-(4-methylpentylthio)benzoyl acid for o-toluic acid in Example 369.

[1473] MS(ESI) m/e 442 (M+H)+

[1474] 1H NMR (500 MHz, CD3OD) δ 7.83 (m, 1H), 7.66 (m, 1H), 7.54 (m, 1H), 7.42 (m, 1H), 4.49 (d, 0.3H), 4.44 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 3H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.66 (m, 2H), 1.56 (m, 1H), 1.34 (m, 2H), 1.29-1.24 (m, 6H), 0.89 (d, 6H).

EXAMPLE 433

N-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(sec-butylsulfanyl)benzohydrazide

[1475] The desired compound was prepared by substituting 3-(1-methylpropylthio)benzoyl acid for o-toluic acid in Example 369.

[1476] MS(ESI) m/e 414 (M+H)+

[1477] 1H NMR (500 MHz, CD3OD) δ 7.90 (m, 1H), 7.72 (m, 1H), 7.61 (m, 1H), 7.44 (m, 1H), 4.49 (d, 0.3H), 4.45 (d, 0.7H), 3.78 (m, 1H), 3.51 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.62 (m, 2H), 1.29-1.24 (m, 4H), 1.03 (t, 3H)

EXAMPLE 434

N-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(n-propylsulfanyl)benzohydrazide

[1478] The desired compound was prepared by substituting 3-(2,2-dimethylpropylthio)benzoyl acid for o-toluic acid in Example 369.

[1479] MS(ESI) m/e 428 (M+H)+

[1480] 1H NMR (500 MHz, CD3OD) δ 7.86 (m, 1H), 7.65 (m, 1H), 7.57 (m, 1H), 7.40 (m, 1H), 4.49 (d, 0.3H), 4.45 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 3H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H), 1.05 (s, 9H)

EXAMPLE 435

N-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(cyclohexylsulfanyl)benzohydrazide

[1481] The desired compound was prepared by substituting 3-(cyclohexylthio)benzoyl acid for o-toluic acid in Example 369.

[1482] MS(ESI) m/e 440 (M+H)+

[1483] 1H NMR (500 MHz, CD3OD) δ 7.90 (m, 1H), 7.72 (m, 1H), 7.60 (m, 1H), 7.43 (m, 1H), 4.49 (d, 0.3H), 4.45 (d, 0.7H), 3.78 (m, 1H), 3.25 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.86 (m, 1H), 1.29-1.24 (m, 6H), 1.05 (d, 6H).
2H), 2.15 (m, 1H), 1.98 (m, 3H), 1.78 (m, 2H), 1.65 (m, 2H), 1.38 (m, 4H), 1.29-1.24 (m, 6H).

**EXAMPLE 436**
N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanyl)pentanoyl)-3-(cyclohexylmethyl)sulfanyl)benzohydrazide

**[1484]** The desired compound was prepared by substituting 3-(cyclohexylethylthio)benzoic acid for o-toluic acid in Example 369.

**[1485]** MS(ESI) m/e 454 (M+H)^+; 456 (M+H)^+;

**[1486]** 'H NMR (500 MHz, CD3OD) δ 7.82 (m, 1H), 7.65 (t, 1H), 7.53 (t, 1H), 7.41 (m, 1H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.90 (d, 2H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 3H), 1.91 (m, 2H), 1.74 (m, 2H), 1.66 (m, 2H), 1.53 (m, 1H), 1.29-1.18 (m, 8H), 1.05 (m, 2H).

**EXAMPLE 437**
N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanyl)pentanoyl)-3-(benzylsulfanyl)benzohydrazide

**[1487]** The desired compound was prepared by substituting 3-(benzylthio)benzoic acid for o-toluic acid in Example 369.

**[1488]** MS(ESI) m/e 448 (M+H)^+; 446 (M+H)^+;

**[1489]** 'H NMR (500 MHz, CD3OD) δ 7.86 (m, 1H), 7.67 (m, 1H), 7.52 (m, 1H), 7.39 (m, 1H), 7.31 (d, 2H), 7.26 (t, 2H), 7.20 (m, 1H), 4.49 (d, 0.3H), 4.45 (d, 0.7H), 4.22 (s, 2H), 3.77 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.25 (m, 6H).

**EXAMPLE 438**
N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanyl)pentanoyl)-3-((2-phenylethyl)sulfanyl)benzohydrazide

**[1490]** The desired compound was prepared by substituting 3-(2-phenylethylthio)benzoic acid for o-toluic acid in Example 369.

**[1491]** MS(ESI) m/e 462 (M+H)^+; 464 (M+H)^+;

**[1492]** 'H NMR (500 MHz, CD3OD) δ 7.87 (m, 1H), 7.68 (m, 1H), 7.57 (m, 1H), 7.44 (m, 1H), 7.27 (t, 2H), 7.23-7.17 (m, 3H). 4.49 (d, 0.3H), 4.45 (d, 0.7H), 3.77 (m, 1H), 3.26 (t, 2H), 3.00 (m, 1H), 2.93 (t, 2H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

**EXAMPLE 439**
N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanyl)pentanoyl)-3-((3-phenylpropyl)sulfanyl)benzohydrazide

**[1493]** The desired compound was prepared by substituting 3-(3-phenylpropylthio)benzoic acid for o-toluic acid in Example 369.

**[1494]** MS(ESI) m/e 476 (M+H)^+; 478 (M+H)^+;

**[1495]** 'H NMR (500 MHz, CD3OD) δ 7.84 (m, 1H), 7.67 (m, 1H), 7.51 (m, 1H), 7.41 (m, 1H), 7.25 (t, 2H), 7.15 (m, 3H), 4.49 (d, 0.3H), 4.44 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 3H), 2.76 (t, 2H), 2.72 (t, 2H), 2.15 (m, 1H), 1.96 (m, 3H), 1.29-1.24 (m, 6H).

**EXAMPLE 440**
N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanyl)pentanoyl)-3-((1,1'-biphenyl)-4-ylmethyl)sulfanyl)benzohydrazide

**[1496]** The desired compound was prepared by substituting 3-(biphenylmethylthio)benzoic acid for o-toluic acid in Example 369.

**[1497]** MS(ESI) m/e 524 (M+H)^+; 526 (M+H)^+;

**[1498]** 'H NMR (500 MHz, CD3OD) δ 7.89 (s, 1H), 7.68 (m, 1H), 7.55 (m, 5H), 7.40 (m, 5H), 7.31 (m, 1H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 4.27 (m, 2H), 3.77 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

**EXAMPLE 441**
N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanyl)pentanoyl)-4-(methylsulfanyl)benzohydrazide

**[1499]** The desired compound was prepared by substituting 4-(methylthio)benzoic acid for o-toluic acid in Example 369.

**[1500]** MS(ESI) m/e 372 (M+H)^+; 374 (M+H)^+;

**[1501]** 'H NMR (500 MHz, CD3OD) δ 7.81 (m, 2H), 7.34 (m, 2H), 4.49 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.53 (s, 3H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.25 (m, 6H).

**EXAMPLE 442**
N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanyl)pentanoyl)-4-(ethylsulfanyl)benzohydrazide

**[1502]** The desired compound was prepared by substituting 4-(ethylthio)benzoic acid for o-toluic acid in Example 369.

**[1503]** MS(ESI) m/e 386 (M+H)^+; 388 (M+H)^+;

**[1504]** 'H NMR (500 MHz, CD3OD) δ 7.81 (m, 2H), 7.38 (m, 2H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.03 (m, 3H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.35 (t, 3H), 1.29-1.25 (m, 6H).

**EXAMPLE 443**
N'-((2RS,3R)-3-amino-2-hydroxy-5-((isopropylsulfanyl)pentanoyl)-4-(propylsulfanyl)benzohydrazide

**[1505]** The desired compound was prepared by substituting 4-(propylthio)benzoic acid for o-toluic acid in Example 369.

**[1506]** MS(ESI) m/e 400 (M+H)^+; 402 (M+H)^+;

**[1507]** 'H NMR (500 MHz, CD3OD) δ 7.80 (m, 2H), 7.38 (m, 2H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.01 (m, 3H), 2.71 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.72 (m, 2H), 1.29-1.24 (m, 6H), 1.06 (t, 3H).
EXAMPLE 444

N^-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)pentanoyl)-4-(butylsulfonyl)benzohydrazide

[1508] The desired compound was prepared by substituting 4-(butylthio)benzoic acid for o-toluic acid in Example 369.

[1509] MS(ESI) m/e 414 (M+H)^+;

[1510] 1H NMR (500 MHz, CD3OD) δ 7.80 (m, 2H), 7.37 (m, 2H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.02 (m, 3H), 2.71 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.67 (m, 2H), 1.50 (m, 2H), 1.29-1.24 (m, 6H), 0.95 (t, 3H).

EXAMPLE 445

N^-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)pentanoyl)-4-(hexylsulfonyl)benzohydrazide

[1511] The desired compound was prepared by substituting 4-(hexylthio)benzoic acid for o-toluic acid in Example 369.

[1512] MS(ESI) m/e 442 (M+H)^+;

[1513] 1H NMR (500 MHz, CD3OD) δ 7.80 (m, 2H), 7.37 (t, 2H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.02 (m, 3H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.68 (m, 2H), 1.47 (m, 2H), 1.33 (m, 4H), 1.29-1.24 (m, 6H), 0.91 (t, 3H).

EXAMPLE 446

N^-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)pentanoyl)-4-(isopentylsulfonyl)benzohydrazide

[1514] The desired compound was prepared by substituting 4-(isopentylthio)benzoic acid for o-toluic acid in Example 369.

[1515] MS(ESI) m/e 400 (M+H)^+;

[1516] 1H NMR (500 MHz, CD3OD) δ 7.81 (m, 2H), 7.43 (dd, 2H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.02 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.34 (d, 6H), 1.29-1.24 (m, 6H).

EXAMPLE 447

N^-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)pentanoyl)-4-(isobutylsulfonyl)benzohydrazide

[1517] The desired compound was prepared by substituting 4-(2-methylpropylthio)benzoic acid for o-toluic acid in Example 369.

[1518] MS(ESI) m/e 414 (M+H)^+;

[1519] 1H NMR (500 MHz, CD3OD) δ 7.80 (m, 2H), 7.38 (m, 2H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.78 (m, 1H), 3.00 (m, 1H), 2.92 (d, 2H), 2.71 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.90 (m, 1H), 1.29-1.24 (m, 6H), 1.06 (d, 6H).

EXAMPLE 448

N^-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)pentanoyl)-4-(4-methylpentyl)sulfonyl)benzohydrazide

[1520] The desired compound was prepared by substituting 4-(4-methylpentylthio)benzoic acid for o-toluic acid in Example 369.

[1521] MS(ESI) m/e 442 (M+H)^+;

[1522] 1H NMR (500 MHz, CD3OD) δ 7.80 (m, 2H), 7.38 (m, 2H), 4.45 (d, 0.3H), 4.41 (d, 0.7H), 3.71 (m, 1H), 3.01 (m, 3H), 2.71 (t, 2H), 2.13 (m, 1H), 1.96 (m, 1H), 1.69 (m, 2H), 1.57 (m, 1H), 1.36 (m, 2H), 1.29-1.24 (m, 6H), 0.89 (d, 6H).

EXAMPLE 449

N^-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)pentanoyl)-4-(sec-butylsulfonyl)benzohydrazide

[1523] The desired compound was prepared by substituting 4-(1-methylpropylthio)benzoic acid for o-toluic acid in Example 369.

[1524] MS(ESI) m/e 414 (M+H)^+;

[1525] 1H NMR (500 MHz, CD3OD) δ 7.80 (m, 2H), 7.43 (dd, 2H), 4.49 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.65 (m, 2H), 1.33 (d, 3H), 1.29-1.24 (m, 6H), 1.04 (t, 3H).

EXAMPLE 450

N^-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)pentanoyl)-4-(isopentylsulfonyl)benzohydrazide

[1526] The desired compound was prepared by substituting 4-(2,2-dimethylpropylthio)benzoic acid for o-toluic acid in Example 369.

[1527] MS(ESI) m/e 428 (M+H)^+;

[1528] 1H NMR (500 MHz, CD3OD) δ 7.79 (m, 2H), 7.42 (m, 2H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.00 (m, 3H), 2.72 (t, 2H), 2.14 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H), 1.06 (s, 3H).

EXAMPLE 451

N^-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)pentanoyl)-4-(cyclohexylsulfonyl)benzohydrazide

[1529] The desired compound was prepared by substituting 4-(cyclohexylthio)benzoic acid for o-toluic acid in Example 369.

[1530] MS(ESI) m/e 440 (M+H)^+;

[1531] 1H NMR (500 MHz, CD3OD) δ 7.80 (m, 2H), 7.41 (m, 2H), 4.49 (d, 0.3H), 4.44 (d, 0.7H), 3.78 (m, 1H), 3.37 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 3H), 1.79 (m, 2H), 1.65 (m, 2H), 1.39 (m, 4H), 1.29-1.24 (m, 6H).

EXAMPLE 452

N^-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfonyl)pentanoyl)-4-(cyclohexylmethyl)sulfonyl)benzohydrazide

[1532] The desired compound was prepared by substituting 4-(cyclohexylmethylthio)benzoic acid for o-toluic acid in Example 369.

[1533] MS(ESI) m/e 454 (M+H)^+;
[1534] 1H NMR (500 MHz, CD,OD) δ 7.79 (m, 2H), 7.37 (m, 1H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.00 (m, 1H), 2.91 (d, 2H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.92 (m, 2H), 1.75 (m, 2H), 1.67 (m, 2H), 1.56 (m, 1H), 1.29-1.21 (m, 8H), 1.06 (m, 2H).

EXAMPLE 453
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-(benzylsulfanyl)benzohydrazide

[1535] The desired compound was prepared by substituting 4-(benzylthio)benzoic acid for o-toluic acid in Example 369.

[1536] MS(ESI) m/e 448 (M+H)+;

[1537] 1H NMR (500 MHz, CD,OD) δ 7.77 (m, 2H), 7.39 (m, 4H), 7.28 (t, 2H), 7.22 (m, 1H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 4.27 (s, 0.7H), 4.26 (s, 0.3H), 3.77 (m, 1H), 3.00 (m, 1H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.23 (m, 6H).

EXAMPLE 454
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-(2-phenylethyl)sulfanyl)benzohydrazide

[1538] The desired compound was prepared by substituting 4-(2-phenylethylthio)benzoic acid for o-toluic acid in Example 369.

[1539] MS(ESI) m/e 462 (M+H)+;

[1540] 1H NMR (500 MHz, CD,OD) δ 7.82 (m, 2H), 7.41 (m, 2H), 7.28 (m, 2H), 7.21 (m, 3H), 7.27 (t, 2H), 7.27-7.17 (m, 3H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.28 (m, 2H), 3.00 (m, 1H), 2.96 (t, 2H), 2.72 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.24 (m, 6H).

EXAMPLE 456
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-(3-phenylpropyl)sulfanyl)benzo-
hydrazide

[1541] The desired compound was prepared by substituting 4-(3-phenylpropionyl)benzoic acid for o-toluic acid in Example 369.

[1542] MS(ESI) m/e 476 (M+H)+;

[1543] 1H NMR (500 MHz, CD,OD) δ 7.78 (m, 2H), 7.33 (m, 2H), 7.27 (m, 2H), 7.18 (m, 3H), 4.48 (d, 0.3H), 4.44 (d, 0.7H), 3.77 (m, 1H), 3.01 (m, 3H), 2.77 (t, 2H), 2.71 (t, 2H), 2.15 (m, 1H), 1.98 (m, 3H), 1.29-1.24 (m, 6H).

EXAMPLE 457
N’-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-((1,1’-biphenyl)-4-ylmethyl)sulfanyl)benzohydrazide

[1544] The desired compound was prepared by substituting 4-(biphenylethylthio)benzoic acid for o-toluic acid in Example 369.

[1545] MS(ESI) m/e 524 (M+H)+;

[1546] 1H NMR (500 MHz, CD,OD) δ 7.78 (m, 2H), 7.58 (d, 2H), 7.55 (d, 2H), 7.43 (m, 6H), 7.31 (m, 1H), 4.48 (d, 0.3H), 4.33 (d, 0.7H), 4.32 (s, 1.4H), 4.31 (s, 0.6H), 3.76 (m, 1H), 3.00 (m, 1H), 2.71 (t, 2H), 2.15 (m, 1H), 1.98 (m, 1H), 1.29-1.25 (m, 6H).

EXAMPLE 458
(2S,3R)-3-amino-N’-(3-chlorobenzoyl)-2-hydroxy-5-phenylpentanohydrazide Example 458A 4-phenylbutanal

[1547] A solution of 4-phenylbutyric acid (1.64 g, 10.0 mmol), N,O-dimethyl hydroxylamine hydrochloride (1.58 g, 16 mmol), 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide hydrochloride (2.06 g, 10.7 mmol), 1-hydroxybenzotriazole (1.56 g, 11.6 mmol), and N-methylmorpholine (2.8 ml, 26 mmol) in dichloromethane (40 ml) at room temperature was stirred for 16 hours, diluted with dichloromethane, washed sequentially with aqueous NaHCO3, brine, 10% KHSO4, and brine, dried (MgSO4), filtered, and concentrated. The concentrate and lithium aluminum hydride (9.0 mmol, 1 equivalent) in diethyl ether (49 ml) at room temperature was stirred 90 minutes, treated with IM NaHCO3, diluted with ether, washed sequentially with 10% KHSO4, and brine, dried (MgSO4), filtered then concentrated to provide the desired product.

[1548] MS(ESI) m/e 148 (M+H)+.

EXAMPLE 458B
(2S,3R)-3-((tert-butoxycarbonyl)amino)-2-hydroxy-6-phenylhexanoic acid

[1549] The desired product was prepared by substituting Example 458A for 2-ethylhexan-2-ol in Examples 236A-236C.

[1550] MS(ESI) m/e 324 (M+H)+.

EXAMPLE 458C
(2S,3R)-3-amino-N’-(3-chlorobenzoyl)-2-hydroxy-5-phenylpentanohydrazide

[1551] The desired product was prepared by substituting 3-chlorobenzyllhydrazine for O-phenyl hydroxylamine hydrochloride and Example 458B for Example 98A in Example 98B.

[1552] MS(ESI) m/e 376 (M+H)+;

[1553] 1H NMR (300 MHz, DMSO-d6) δ 10.69 (br s, 1H), 10.30 (br s, 1H), 8.24 (br s, 2H), 7.92 (m, 1H), 7.86 (d, 1H), 7.69 (d, 1H), 7.57 (t, 1H), 7.24 (m, 5H), 6.62 (m, 1H), 4.21 (m, 1H), 2.60 (m, 2H) 1.90-1.55 (m, 4H).

EXAMPLE 459
(2S,3R)-3-amino-N’-(3-chlorobenzoyl)-2-hydroxy-5-(1H-indol-3-yl)pentanohydrazide

EXAMPLE 459A
3-(3-indolyl)propional

[1554] The desired product was prepared by substituting 3-indolylpropionic acid for 4-phenylbutyric acid in Example 458A.
EXAMPLE 459B

(2S,3R)-3-(tert-butoxycarbonyl)amino-2-hydroxy-5-(3-indoly)pentanoic acid. The desired product was prepared by substituting Example 459A for 2-ethylhexanol in Examples 236A-236C.

EXAMPLE 459C

(2S,3R)-3-amino-N′-(3-chlorobenzoyl)-2-hydroxy-5-(3H-indol-3-yl)pentanohydrazide

The desired product was prepared by substituting 3-chlorobenzoylhydrazine for O-phenyl hydroxylamine hydrochloride and Example 459B for Example 98A in Example 98B.

EXAMPLE 460

(2RS,3R)-3-amino-N′-(3-(2,3-dihydroxypropoxy) benzoyl)-2-hydroxy-5-isopropylsulfanyl)pentanohydrazide

Example 460A

methyl 3-(prop-2-enyloxy)benzoate

Methyl-3-hydroxy-benzoate (1.09 g, 4.9 mmol), allyl bromide (0.73 g, 6.0 mmol) and potassium tert-butoxide (6.5 g, 58 mmol) in DMSO (15 mL) was stirred at room temperature for 16 hours. The mixture was poured into ice water, extracted with ether, washed with brine, dried (Na2SO4), and evaporated to give the title compound.

Example 460B

methyl 3-(2,3-dihydroxypropoxy)benzoate

A solution of Example 460A (0.3 g, 1.5 mmol), 4-methylmorpholine N-oxide (0.55 g, 4.5 mmol) and osmium tetroxide (4 wt% solution in water 0.1 mL, 0.015 mmol) in 9:1 acetone:water was stirred at room temperature for 48h. The reaction was quenched with 10% Na2S03 and stirred for 15 minutes, extracted with ethyl acetate, washed with brine, dried (Na2SO4), and concentrated to give the title compound.

EXAMPLE 460C

Methyl 3-(2,3-di(tertbutildimethylsilyloxy)propoxy)benzoate

A solution of Example 460B (0.26 g, 1.15 mmol), tert-butyl(dimethyl)silyl chloride (0.44 g, 2.87 mmol) and imidazole (0.31 g, 4.6 mmol) in DMF (10 mL) was stirred at room temperature for 18 hours. The mixture was diluted with ether, washed with brine, dried (Na2SO4), and concentrated to give the title compound.

EXAMPLE 460D

(2RS,3R)-3-amino-N′-(3-(2,3-dihydroxypropoxy) benzoyl)-2-hydroxy-5-(isopropylsulfanyl)pentanohydrazide

Example 460C was treated with hydrazine hydrate in ethanol at reflux for 48h. After evaporation of the reaction mixture to dryness, the resulting hydrazide was reacted with Example 123B as in Example 98B.

EXAMPLE 460E

(2RS,3R)-3-amino-N′-(3-(2,3-dihydroxypropoxy) benzoyl)-2-hydroxy-5-(isopropylsulfanyl)pentanohydrazide

It will be evident to one skilled in the art that the present invention is not limited to the foregoing illustrative examples, and that it can be embodied in other specific forms without departing from the essential attributes thereof. It is therefore desired that the examples be considered in all respects as illustrative and not restrictive, reference being made to the appended claims, and all changes which come within the meaning and range of equivalency of the claims and therefore intended to be embraced therein.

What is claimed is:

1. A compound of formula (I),

or a therapeutically acceptable salt or prodrug thereof, wherein

R1 is selected from the group consisting of alkyl, aryl, aroylalkyl, cycloalkyl, (cycloalkyl)alkyl, (heterocycle)alkyl, and R3S-(alkylene)-
wherein each group is drawn with its right-hand end being the end that is attached to the parent molecular moiety;

R\(^3\) is selected from the group consisting of hydrogen, alkyl, and arylalkyl;

R\(^4\) is selected from the group consisting of —NR\(^2\)R\(^7\), and —OR wherein each group is drawn with its left-hand end being the end that is attached to the parent molecular moiety;

R\(^5\) is selected from the group consisting of alkyl, aryl, arylalkyl, cycloalkyl, and (cycloalkyl)alkyl;

R\(^6\) and R\(^7\) are independently selected from the group consisting of hydroxyl, alkanoyl, alkylalkoxyalkyl, alkyl, alkylalkoxyalkyl, alkylalkoxyalkylalkyl, alkylsulfanylalkyl, aryl, arylalkanoyl, arylalkoxyalkyl, arylalkoxyalkylalkyl, arylalkoxyalkylalkylalkyl, (aryl)oxyalkyl, (aryl)sulfonyl, carboxyalkyl, cycloalkyl, (cycloalkyl)alkyl, (cycloalkyl)alkanoyl, (cycloalkyl)oxy, haloalkanoyl, haloalkyl, heterocycle, (heterocycle)alkanoyl, (heterocycle)oxy, hydroxyl, a nitrogen protecting group, and —(O)(O)NR\(^8\); or

R\(^8\) and R\(^7\) together are arylalkylidene; or

R\(^6\) and R\(^7\), together with the nitrogen atom to which they are attached, form a heterocycle;

R\(^9\) is selected from the group consisting of hydrogen, alkanoylalkyl, alkylalkoxyalkylalkyl, alkyl, amidoalkyl, aryl, arylalkyl, arylalkoxyalkylalkyl, (aryl)alkyl, carboxyalkyl, and (cycloalkyl)alkyl; and

R\(^9\) and R\(^10\) are independently selected from the group consisting of hydrogen, alkyl and aryl.

2. A compound according to claim 1, wherein R\(^1\) is selected from the group consisting of alkyl, cycloalkyl, (cycloalkyl)alkyl, arylalkyl, and (heterocycle)alkyl.

3. A compound according to claim 2, wherein R\(^1\) is —OR\(^8\).

4. A compound according to claim 3 selected from the group consisting of

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N-phenoxypybutanamide;

(2RS,3R)-3-amino-N-(benzoxyl)-4-cyclohexyl-2-hydroxybutanamide;

(2RS,3R)-3-amino-N-(methoxy)-4-cyclohexyl-2-hydroxybutanamide;

(2RS,3R)-3-amino-N-(tert-butoxy)-4-cyclohexyl-2-hydroxybutanamide;

(2RS,3R)-3-amino-4-cyclohexyl-N-ethoxy-2-hydroxybutanamide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N-isobutoxybutanamide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N,2-dihydroxybutanamide;

(2RS,3R)-3-amino-3-cyclohexyl-2-hydroxy-N-phenoxypypropanamide;

(2RS,3R)-3-amino-5-phenyl-2-hydroxy-N-phenoxypytanamide;

(2RS,3R)-3-amino-3-cyclooctyl-2-hydroxy-N-phenoxypypropanamide;

(2RS,3R)-3-amino-5-cyclohexyl-2-hydroxy-N-phenoxypytanamide;

ethyl ((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)amino)oxy)acetate;

benzyl ((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)amino)oxy)acetate;

(((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)amino)oxy)acetic acid;

ethyl (2S)-2-(((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)amino)oxy)acetethyl)amino)propanoate;

(2RS,3R)-3-amino-cyclohexyl-2-hydroxy-N-(2-oxo-2-((2-phenylethyl)amino)ethoxy)butanamide;

(2RS,3R)-3-amino-N-(benzoxyl)-3-cyclohexyl-2-hydroxypropanamide; and

(2RS,3R)-3-amino-N-(benzoxyl)-2-hydroxy-5-phenoxypytanamide.

5. A compound according to claim 2 wherein R\(^1\) is —NR\(^8\) R\(^7\).

6. A compound according to claim 5 wherein one of R\(^6\) and R\(^7\) is hydrogen and the other is (aryl)oxy.

7. A compound according to claim 6 selected from the group consisting of

N′-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-1-naphthylhydradize;

N′-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-ethoxybenzohydrazide;

N′-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3,5-dimethoxybenzohydrazide;

N′-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2-chlorobenzohydrazide;

N′-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2-bromobenzohydrazide;

N′-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-methoxybenzohydrazide;

N′-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,5-dichlorobenzohydrazide;

N′-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2-methoxybenzohydrazide;

N′-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-chlorobenzohydrazide;

N′-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-methylbenzohydrazide;

N′-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,4-dihydroxybenzohydrazide;

N′-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,5-dimethoxybenzohydrazide;

N′-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-methylbenzohydrazide;
N-O-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-nitrobenzoylhydrazide;
N-O-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2-naphthohydrazide;
N-O-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-chlorobenzohydrazide;
(2RS,3R)-3-amino-N’-benzoyl-4-cyclohexyl-2-hydroxybutanoylhydrazide;
N-O-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-bromobenzohydrazide;
N-O-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-tert-butylbenzohydrazide;
N-O-(2RS,3R)-3-amino-3-cyclohexyl-2-hydroxypropionyl)-3-chlorobenzohydrazide;
N-O-(2RS,3R)-3-amino-2-hydroxy-5-phenylpentanoyl)-3-chlorobenzohydrazide;
N-O-(2RS,3R)-3-amino-3-cyclohexyl-2-hydroxypropionyl)-3-chlorobenzohydrazide;
N-O-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-1-naphthohydrazide;
N-O-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-hydroxy-2-naphthohydrazide;
N-O-(2S,3R)-3-amino-2-hydroxy-5-phenylpentanoyl)-1-naphthohydrazide;
N-O-(2S,3R)-3-amino-2-hydroxy-5-phenylpentanoyl)-3-hydroxy-2-naphthohydrazide;
N-O-(2S,3R)-3-amino-4-ethyl-2-hydroxyoctanoyl)-3-chlorobenzohydrazide;
N-O-(2S,3R)-3-amino-5-cyclohexyl-2-hydroxypentanoyl)-3-chlorobenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2-hydroxybenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2-methylbenzohydrazide;
2-amino-N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)benzohydrazide;
4-amino-N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)benzohydrazide;
3-amino-N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)benzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-hydroxybenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-hydroxybenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-methoxybenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2-fluorobenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-fluorobenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-fluorobenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2-bromobenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-cyanobenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-cyanobenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-(dimethylamino)benzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-(dimethylamino)benzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-(trifluoromethyl)benzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-(trifluoromethyl)benzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-(trifluoromethoxy)benzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-4-(trifluoromethoxy)benzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,4-dimethylbenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,5-dimethylbenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3,4-dimethylbenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3,5-dimethylbenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,3-dimethylbenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3,4-dimethoxybenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3,4,5-trimethoxybenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,3,4-dichlorobenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,4-dichlorobenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3,4-dichlorobenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3,5-dichlorobenzohydrazide;
N-O-(2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-2,3-dimethylbenzohydrazide;
(2S,3R)-3-amino-N-O-(3-chlorobenzoyl)-2-hydroxy-5-phenylpentanoylhydrazide; and
(2S,3R)-3-amino-N-O-(3-chlorobenzoyl)-2-hydroxy-5-(1H-indol-3-yl)pentanoylhydrazide.
8. A compound according to claim 5 wherein one of R<sup>1</sup> and R<sup>2</sup> is selected from the group consisting of hydrogen, alkyl, and aryl; and the other is selected from the group consisting of hydrogen, alkyl, and arylalkyl.

9. A compound according to claim 8 selected from the group consisting of

(2RS,3R)-3-amino-N'-benzyl-4-cyclohexyl-2-hydroxybutanohydrazide;

(2RS,3R)-3-amino-N'-benzyl-4-cyclohexyl-2-hydroxybutanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(2-phe-nylethyl)butanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-methyl-N'-phenylbutanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(4-methylphenyl)butanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(4-methoxyphenyl)butanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(1-naph-thyl)butanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-N'-(2,4-difluorophenyl)-2-hydroxybutanohydrazide;

4-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)benzenesulfonamide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-phenylbutanohydrazide;

(2RS,3R)-3-amino-N'-4-bromophenyl)-4-cyclohexyl-2-hydroxybutanohydrazide;

(2RS,3R)-3-amino-N'-2-chlorophenyl)-4-cyclohexyl-2-hydroxybutanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-[(3-trifluoromethyl)phenyl]butanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(4-iodophenyl)butanohydrazide;

(2RS,3R)-3-amino-N'-3-chlorophenyl)-4-cyclohexyl-2-hydroxybutanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(3-methoxyphenyl)butanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-N'-(3,5-dichlorophenyl)-2-hydroxybutanohydrazide;

(2RS,3R)-3-amino-N'-3-bromophenyl)-4-cyclohexyl-2-hydroxybutanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(3-methoxyphenyl)butanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-N'-(3,5-dichlorophenyl)-2-hydroxybutanohydrazide;

(2RS,3R)-3-amino-N'-3-bromophenyl)-4-cyclohexyl-2-hydroxybutanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(3-methoxyphenyl)butanohydrazide;

(2RS,3R)-3-amino-N'-3-chloro-4-methylphenyl)-4-cyclohexyl-2-hydroxybutanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(4-(trifluoromethoxy)phenyl)butanohydrazide;

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(4-(fluorophenyl)butanohydrazide;
(2RS,3R)-3-amino-4-cyclohexyl-N'-heptyl-2-hydroxy-N'-phenylbutanozydrazide;
(2RS,3R)-3-amino-4-cyclohexyl-N'-ethyl-2-hydroxy-N'-phenylbutanozydrazide;
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(2-(4-methylphenyl)ethyl)-N'-phenylbutanozydrazide;
(2RS,3R)-3-amino-4-cyclohexyl-N'-(2RS)-2-ethylhexyl-2-hydroxy-N'-phenylbutanozydrazide;
(2RS,3R)-3-amino-N'-((2RS)-2-(4-chlorophenyl)-2-cyclooctyl)-4-cyclohexyl-2-hydroxy-N'-phenylbutanozydrazide;
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-phenyl-N'-(2RS)-2-phenylpropyl)butanozydrazide;
(2RS,3R)-3-amino-3-cyclohexyl-2-hydroxy-N'-(4-methylphenyl)propanoylbutanozydrazide;
(2RS,3R)-3-amino-2-hydroxy-5-phenyl-N'-(4-methylphenyl)pentanoylbutanozydrazide;
(25,3R)-3-amino-3-cyclooctyl-2-hydroxy-N'-(4-methylphenyl)propanoylbutanozydrazide;
(2RS,3S)-3-amino-4-((cyclohexylmethyl)sulfanyl)-2-hydroxy-N'-(4-methylphenyl)butanoylbutanozydrazide;
(2RS,3R)-3-amino-3-cyclohexyl-2-hydroxy-N'-(1-naphthyl)propanoylbutanozydrazide;
(2RS,3R)-3-amino-2-hydroxy-5-phenyl-N'-(1-naphthyl)pentanoylbutanozydrazide;
(2RS,3R)-3-amino-3-cyclooctyl-2-hydroxy-N'-(1-naphthyl)propanoylbutanozydrazide;
(2RS,3R)-3-amino-5-cyclohexyl-2-hydroxy-N'-(4-methylphenyl)pentanoylbutanozydrazide;
(2RS,3R)-3-amino-5-cyclohexyl-2-hydroxy-N'-(1-naphthyl)pentanoylbutanozydrazide; and (2S,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoylbutanozydrazide.

10. A compound according to claim 5 wherein one of R⁸ and R⁹ is selected from the group consisting of hydrogen, alkyl, and aryl and the other is selected from the group consisting of alkanoyl, alkencyl, alkelyxoylalkyl, alkoxyalkyl, alkoxyacylloxyacylalkyl, alklylsulfanyalkyl, aryloxyalkyl, aryalkoxyacylalkyl, arylsulfonyl, carboxyalkyl, —C(O)R⁹, —CO₂alkyl, (cycloalkyl)alkyl, haloalkanol, haloalkyl, heterocycle, (heterocycle)oyl, and hydroxyalkyl.

11. A compound according to claim 10 selected from the group consisting of
(2RS,3R)-3-amino-N'-(7-chloro-4-quinolinyl)-4-cyclohexyl-2-hydroxybutanoylbutanozydrazide;
2-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl-N-(4-iodophenyl)hydrazinecarboxamide;
N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl-2,4,6-trimethylbenzenesulfonoylhydrazide;
ethyl (2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazino)acetate trifluoracetate;
benzyl 2-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazinecarboxylate;
ethyl 3-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazino)-3-exopropanoate;
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(2,2,2-trifluoroethyl)butanoylbutanozydrazide;
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-methyl-N'-(4-nitro-2-pyridinyl)butanoylbutanozydrazide;
(2RS,3R)-3-amino-N',4-dicyclohexyl-2-hydroxybutanozydrazide;
(2RS,3R)-3-amino-N'-(6-chloro-3-pyridazinyl)-4-cyclohexyl-2-hydroxy-N'-methylbutanoylbutanozydrazide;
(2RS,3R)-3-amino-N'-(5-chloro-1-methyl-6-oxo-1,6-dihydro-4-pyridazinyl)4-cyclohexyl-2-hydroxy-N'-methylbutanoylbutanozydrazide;
N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-1,3-benzodioxole-5-carboxylic acid;
methyl 2-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazino)-4-(trifluoromethyl)-5-pyrimidinecarboxylate;
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(2RS)-2-hydroxy-3-(3-(trifluoromethyl)phenoxo)propyl)N'-methylbutanoylbutanozydrazide;
methyl 3-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazino)-2-thiophencarboxylate;
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(2-pyridinylcarbonyl)butanoylbutanozydrazide;
ethyl 3-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazino)-6,6-dimethyl-4-oxo-4,5,6,7-tetrahydro-2-benzothiophene-1-carboxylate;
(2RS,3R)-3-amino-N'-(13-benzothiazol-2-yl)-4-cyclohexyl-2-hydroxybutanoylbutanozydrazide;
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(trifluoroacetyl)butanoylbutanozydrazide;
N'-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-3-chloro-1-benzothiophene-2-carboxylic acid;
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(2-quinolinalinyl)butanoylbutanozydrazide;
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-methyl-N'-(4-(trifluoromethyl)-2-pyridinyl)butanoylbutanozydrazide;
(2RS,3R)-3-amino-4-cyclohexyl-N'-(13-dimethyl-4-nitro-1H-pyrazol-5-yl)-2-hydroxybutanoylbutanozydrazide;
2-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl-N-phenylhydrazinecarboxamide;
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl-N-(4-chloro-2-methoxyphenyl)hydrazinecarboxamide;
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-N-(3-fluorophenyl)hydrazinecarboxamide;
N'-(1R)-1-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazino)carbonyl)-3-(methylsulfanyl)propyl)-4-(trifluoromethyl)benzamide;
(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-2-thiencarbonyl)butanoylbutanozydrazide;
4-chlorobenzyl 2-((2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)hydrazino)-4-(trifluoromethyl)-5-pyrimidinecarboxylate; 

(2RS,3R)-3-amino-N'-(6-chloro-3-pyridazinyl)-4-cyclohexyl-2-hydroxybutanohydrazide; 

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(3RS)-3-(methylsulfonyl)butyl-N'-phenylbutanohydrazide; 

(2RS,3R)-3-amino-4-cyclohexyl-N'-(cyclopropyldimethyl)-2-hydroxy-N'-phenylbutanohydrazide; 

(2RS,3R)-3-amino-N'-(2-benzoyloxyethyl)-4-cyclohexyl-1,2-hydroxy-N'-phenylbutanohydrazide; 

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-phenyl-N'-(2,2,3-trichloropropyl)butanohydrazide; 

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(3-(methylsulfonyl)propyl)-N'-phenylbutanohydrazide; 

(2RS,3R)-3-amino-4-cyclohexyl-N'-(cyclopropymethyl)-2-hydroxy-N'-phenylbutanohydrazide; 

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(5-hydroxypentyl)-N'-phenylbutanohydrazide; 

(2RS,3R)-3-amino-4-cyclohexyl-N'-(4(2R,3R)C-3-aminocyclohexyl-2-hydroxybutanoyl)-1-phenylhydrazino)butanoic acid; 

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(11Z)-11-hexadecenyl-2-hydroxy-N'-phenylbutanohydrazide; 

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-tridecylbutanohydrazide; 

4-(2-(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxybutanoyl)-1-phenylhydrazino)butanoic acid; 

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(6Z)-6-nonenoyl)-N'-phenylbutanohydrazide; 

(2RS,3R)-3-amino-4-cyclohexyl-N'-(4(2Z)-4-deceny)-2-hydroxy-N'-phenylbutanohydrazide; 

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(4-phenethyl)-N'-phenylbutanohydrazide; 

(2RS,3R)-3-amino-4-cyclohexyl-N'-(3RS)-3,7-dimethyl-6-octenyl)-2-hydroxy-N'-phenylbutanohydrazide; 

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-phenyl-N'-(4,4,4-trifluorobutyl)butanohydrazide; 

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(3RS)-3-hydroxybutyl)-N'-95 phenylbutanohydrazide; 

(2RS,3R)-3-amino-4-cyclohexyl-N'-(2-(3RS)-3,7-dimethyl-6-(octenyl)oxyethyl)-2-hydroxy-N'-phenylbutanohydrazide; 

(2RS,3R)-3-amino-4-cyclohexyl-N'-(2-(3RS)-3,3-dimethylcyclohexyl)ethyl)-2-hydroxy-N'-phenylbutanohydrazide; 

(2RS,3R)-3-amino-N'-(4S)-6-bromo-4-methylhexyl)-4-cyclohexyl-2-hydroxy-N'-phenylbutanohydrazide; and 

(2RS,3R)-3-amino-4-cyclohexyl-N'-(cyclohexylmethyl)-2-hydroxy-N'-phenylbutanohydrazide. 

12. A compound according to claim 5 wherein R³ and R⁴ together are aryalkylidene. 

13. A compound according to claim 12 which is 

(2RS,3R)-3-amino-N'-(E)-4-chlorophenyl)methyldiene)-4-cyclohexyl-2-hydroxybutanohydrazide. 

14. A compound according to claim 12 wherein R³ and R⁴, together with the nitrogen atom to which they are attached, form a heterocycle. 

15. A compound according to claim 14 selected from the group consisting of 

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(2S)-2-(methoxyethyl)pyrrolidinyl)butanamide; 

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-1-pyrrolidinyl)butanamide; 

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(4-oxo-2-thioxo-1,3-thiazolidin-3-yl)butanamide; 

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(1-piperidinyl)butanamide; and 

(2RS,3R)-3-amino-4-cyclohexyl-2-hydroxy-N'-(2R)-2-(methoxyethyl)pyrrolidinyl)butanamide. 

16. A compound according to claim 1 wherein R³ is R⁴(R³=allylene). 

17. A compound according to claim 16 wherein R³ is —OR³. 

18. A compound according to claim 17 selected from the group consisting of 

(2RS,3R)-3-amino-5-(ethyloxyl)-2-hydroxy-N-phenoxypentamide; 

(2RS,3R)-3-amino-4-(ethylsulfonyl)-2-hydroxy-N-phenoxypentamide; 

(2RS,3R)-3-amino-2-hydroxy-N-phenoxo-4-(propylsulfanyl)butanamide; 

(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)-N-phenoxypentamide; 

(2RS,3R)-3-amino-2-hydroxy-4-(isobutylsulfanyl)-N-phenoxypentamide; 

(2RS,3R)-3-amino-4-(cyclohexylmethyl)sulfanyl)-2-hydroxy-N-phenoxypentamidde; 

(2RS,3R)-3-amino-5-(tethylsulfanyl)-2-hydroxy-N-benzyloxypentamide; 

(2RS,3R)-3-amino-N-(benzyloxy)-2-hydroxy-5-(isopropylsulfanyl)pentanamide; 

(2RS,3R)-3-amino-N-(benzyloxy)-2-hydroxy-4-(isobutylsulfanyl)butanamide; 

(2RS,3R)-3-amino-N-(cyclohexylmethoxy)-2-hydroxy-4-(isobutylsulfanyl)butanamide; 

(2RS,3R)-3-amino-2-hydroxy-4-(isobutylsulfanyl)-N-(mesitylmethoxy)butanamide; 

(2RS,3R)-3-amino-2-hydroxy-5-(ethylsulfanyl)-N-((1RS)-1-phenylethoxy)pentanamide;
(2S,3S)-3-amino-N-(benzylxoy)-2-hydroxy-4-(isobutylsulfonyl)-N-methylbutanamide; 
(2S,3S)-3-amino-N-(benzylxoy)-2-hydroxy-5-(isopropylsulfanyl)-N-methylpentanamide; and 
(2S,3S)-3-amino-2-hydroxy-5-(isopropylsulfanyl)-N-((1RS)-1-phenylethoxy)pentanamide. 

19. A compound according to claim 18 wherein R^4 is \(-\text{NR}^5\). 
20. A compound according to claim 19 wherein one of R^6 and R^7 is hydrogen and the other is (aryl)oyl. 
21. A compound according to claim 20 wherein the aryl(oyl) is unsubstituted. 
22. A compound according to claim 21 selected from the group consisting of 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl-2-naphthohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoylbenzohydrazide; 
N^+-(2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-naphthohydrazide; 
N^+-(2S,3S)-3-amino-2-hydroxy-4-(isobutylsulfanyl)butanoyl)-2-naphthohydrazide; 
N^+-(2S,3S)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl-1-naphthohydrazide; and 
N^+-(2S,3S)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-1-naphthohydrazide. 
23. A compound according to claim 20 wherein the ary(oyl) is substituted with one substituent. 
24. A compound according to claim 23 wherein the substituent is at the 2-position. 
25. A compound according to claim 24 selected from the group consisting of 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-chlorobenzohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-hydroxy-2-naphthohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-methylbenzohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-aminobenzohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-hydroxybenzohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-fluorobenzyohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-bromobenzohydrazide; 
N^+-(2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-methylbenzohydrazide; 
N^+-(2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-methoxybenzohydrazide; 
N^+-(2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-fluorobenzohydrazide; 
N^+-(2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-chlorobenzohydrazide. 

N^+-(2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-bromobenzohydrazide; 
N^+-(2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-ethoxybenzohydrazide; 
N^+-(2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-benzylbenzohydrazide; 
N^+-(2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-anilinobenzohydrazide; and 
N^+-(2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-(2-phenylethyl)benzohydrazide. 
26. A compound according to claim 23 wherein the substituent is at the 3-position. 
27. A compound according to claim 26 selected from the group consisting of 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-chlorobenzohydrazide; 
N^+-(2S,3S)-3-amino-4-(ethylsulfanyl)-2-hydroxybutanoyl)-3-chlorobenzohydrazide; 
N^+-(2S,3S)-3-amino-2-hydroxy-4-(propylsulfanyl)butanoyl)-3-chlorobenzohydrazide; 
N^+-(2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-chlorobenzohydrazide; 
N^+-(2S,3S)-3-amino-2-hydroxy-4-(isobutylsulfanyl)butanoyl)-3-chlorobenzohydrazide; 
N^+-(2S,3S)-3-amino-4-(cyclohexylmethylsulfanyl)-2-hydroxybutanoyl)-3-chlorobenzohydrazide; 
N^+-(2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-chlorobenzohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-chlorobenzohydrazide; 
N^+-(2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-chlorobenzohydrazide; 
3-(2-aminooethyl)-N^+-(2S,3S)-3-amino-2-hydroxy-4-(isobutylsulfanyl)butanoyl)benzohydrazide; 
N^+-(2S,3S)-3-amino-2-hydroxy-4-(isobutylsulfanyl)butanoyl)-3-propoxybenzohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-trifluoromethylsulfanylbenzohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-methylbenzohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-aminobenzohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-hydroxybenzohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-methoxybenzohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-fluorobenzohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-(diethylamino)benzohydrazide; 
N^+-(2S,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-trifluoromethylbenzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-(trifluoromethoxy)benzohydrazide;
(2RS,3R)-3-amino-N'-4-(3,5-dimethyl-4-hydroxy-5-(isopropylsulfanyl)pentanoyl)-6-phenyl-1,2,4-triazole benzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-bromobenzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-cyanobenzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-hydroxybenzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-methylbenzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-methoxybenzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-fluorobenzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-bromobenzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(methylsulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(ethylsulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(propylsulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(butylsulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(hexylsulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(isopentylsulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(isobutylsulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(4-methylpentyl)sulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(sec-butylsulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(neopentylsulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(cyclohexylsulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(cyclohexylmethyl)sulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(benzyl)sulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(2-phenethyl)sulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(3-phenylpropyl)sulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-(1,1'-biphenyl)-4-methylsulfanyl)benzohydrazide; and
(2RS,3R)-3-amino-N'-3-(2,3-dihydroxypropoxybenzoyl)-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)
benzohydrazide.
28. A compound according to claim 23 wherein the substituent is at the 4-position.
29. A compound according to claim 28 selected from the group consisting of
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-methylbenzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-aminobenzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-hydroxybenzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-methoxybenzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-fluorobenzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-bromobenzohydrazide; N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-isopropylbenzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-propoxybenzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-methylsulfanyl)benzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-isopropoxybenzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-(diethylamino)benzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-butoxybenzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-chlorobenzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-(dimethylamino)benzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-(trifluoromethyl)benzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-phenoxybenzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-(phenoxymethyl)benzohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-cyanobenzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-methylbenzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-cyanobenzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-fluorobenzohydrazide;
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-fluorobenzohydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-chlorobenzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-bromobenzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-ethylbenzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-propylbenzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-isopropylbenzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-ethoxybenzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-tert-butylbenzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-propoxybenzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-isopropoxybenzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-(methylsulfanyl)benzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-(methylsulfanyl)benzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-(ethylsulfanyl)benzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-(propylsulfanyl)benzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-(butylsulfanyl)benzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-(hexylsulfanyl)benzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-(isopropylsulfanyl)benzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-(isobutylsulfanyl)benzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-((4-methylpentyl)sulfanyl)benzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-((sec-butylsulfanyl)benzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-(1-phenylpentylsulfanyl)benzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-(cyclohexylsulfanyl)benzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-(cyclohexylmethylsulfanyl)benzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-(benzyloxethylsulfanyl)benzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-((2-phenylethyl)sulfanyl)benzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-((3-phenylethyl)sulfanyl)benzoylhydrazide; and
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-4-((1,1'-biphenyl)-4-ylmethylsulfanyl)benzoylhydrazide.

30. A compound according to claim 20 wherein the ary(yl) is substituted with two or three substituents.

31. A compound according to claim 30 selected from the group consisting of
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-3,4-diehtoxybenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-2,3-dimethylbenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-2,4-dimethylbenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-2,5-dimethylbenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-4,5-dimethylbenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-3,5-dimethylbenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-2,3-dimethoxybenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-2,4-dimethoxybenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-2,5-dimethoxybenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-3,4-dimethoxybenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-3,5-dimethoxybenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-3,4,5-trimethoxybenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-2,3-dichlorobenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-2,4-dichlorobenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-2,5-dichlorobenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-3,4-dichlorobenzoylhydrazide;
N':-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxybenzoyl-3,5-dichlorobenzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-2,3-dichlorobenzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-3,3-difluorobenzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-2,3-difluorobenzoylhydrazide;
N':-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl) pentanoyl)-5-chloro-2-methoxybenzoylhydrazide;
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-chloro-5-(methylsulfanyl)benzohydrazide; and
N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3,4-dithoxybenzohydrazide.

32. A compound according to claim 19 wherein one of R¹ and R² is hydrogen; and the other is selected from the group consisting of aryl, arylalkanoyl, arylalkoxycarbonyl, and arylsulfanyl.

33. A compound according to claim 32 selected from the group consisting of
benzyl 2-((2RS,3S)-3-amino-4-(((cyclohexylmethyl)sulfanyl)-2-hydroxybutanoyl)hydrazinecarboxylate;
benzyl 2-((2RS,3S)-3-amino-2-hydroxy-4-(propylsulfanyl)butanoyl)hydrazinecarboxylate;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(4-methylphenyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(4-methoxyphenyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(1-naphthyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(4-iodophenyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(3-chlorophenyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(3-methoxyphenyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(2-chlorophenyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(3-trifluoromethylphenyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(4-isopropyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(3-chloro-4-methylphenyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(3-fluorophenyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(2-ethylphenyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(4-fluorophenyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(4-trifluoromethoxyphenyl)pentanoylhydrazide;
(2RS,3S)-3-amino-4-(ethylsulfanyl)-2-hydroxy-N'-(4-methylphenyl)butanoylhydrazide;
(2RS,3S)-3-amino-2-hydroxy-N'-(4-methylphenyl)-4-(propylsulfanyl)butanoylhydrazide;
(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)-N'-(4-methylphenyl)pentanoylhydrazide;
(2RS,3S)-3-amino-2-hydroxy-4-(isobutylsulfanyl)-N'-(4-methylphenyl)pentanoylhydrazide;
(2RS,3S)-3-amino-4-(ethylsulfanyl)-2-hydroxy-N'-(1-naphthyl)butanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(phenylacetyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(2-methoxyphenyl)acetyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(3-methoxyphenyl)acetyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(2-chlorophenyl)acetyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(3-chlorophenyl)acetyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(4-chlorophenyl)acetyl)pentanoylhydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-(1',4'-biphenyl)-4-ylacetohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-(4-dimethylaminophenyl)acetohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-(1-naphthylacetohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-(2-naphthylacetohydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoylbenzenesulfonylhydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl-3-chlorobenzenesulfonylhydrazide;
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-1-naphthalenesulfonylhydrazide; and
N'-(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-methylbenzenesulfonylhydrazide.

34. A compound according to claim 19 wherein one of R¹ and R² is hydrogen; and the other is selected from the group consisting of alkanoyl, cycloalkyl, cycloalkylalkanoyl, (cycloalkyl)oyl, (heterocycle)alkanoyl, and (heterocycle)oyl.

35. A compound according to claim 34 selected from the group consisting of
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-cy clopentylpentanoylhydrazide;
(2RS,3R)-N-acetyl-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-isobutyrylpentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(3-methylbutanoyl)pentanoylhydrazide;
(2RS,3R)-3-amino-5-(ethylsulfanyl)-N'-heptanoyl-2-hydroxypentanoic acid; 
(2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N'-(tetrhydro-2-furanlycarbonyl)pentanoylhydrazide; 
(2RS,3R)-3-amino-N'-cyclohexylacetyl)-5-(ethylsulfanyl)-2-hydroxypentanoylhydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-furohydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-furohydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-thiophenecarboxyhydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-thiophenecarboxyhydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3H-pyrole-2-carboxyhydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-1,3-thiazole-2-carboxyhydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-1,3-thiazole-4-carboxyhydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-1,3-thiazole-5-carboxyhydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-1H-pyrazole-5-carboxyhydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-1H-pyrazole-4-carboxyhydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-5-isoxazolcarboxyhydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-pyridinecarboxyhydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-(2-pyridinyl)acetohydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-pyridinecarboxyhydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-(3-pyridinyl)acetohydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-pyridinecarboxyhydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-(4-pyridinyl)acetohydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-3-pyridazinecarboxyhydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-4-pyrimidinecarboxyhydrazide; 
N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-2-pyrazinecarboxyhydrazide; 
(2RS,3R)-3-amino-N'-(2RS,SS)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-hydroxy-5-(isopropylsulfanyl)pentanoylhydrazide;N'-((2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxypentanoyl)-1,3-benzodioxole-5-carboxyhydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)-N'- (tetrahydro-2-furanlycarbonyl)pentanoylhydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)-N'-cyclopentylpentanoylhydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-cyclopentylacetohydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)-N'-cyclohexylpentanoylhydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-cyclohexylacetohydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-furohydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-thiophenecarboxyhydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2,5-dimethyl-3-furohydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-thiophenecarboxyhydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-thiophenecarboxyhydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-methyl-2-thiophenecarboxyhydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-5-methyl-2-thiophenecarboxyhydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-1H-pyrole-2-carboxyhydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-1-methyl-1H-pyrole-2-carboxyhydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-1,3-thiazole-2-carboxyhydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-1,3-thiazole-4-carboxyhydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-pyridinecarboxyhydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-6-chloro-2H-chromene-3-carboxyhydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-(4-morpholinyl)acetohydrazide; 
N'-((2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-2-(4-methyl-1-piperazinyl)acetohydrazide; 
and

1-acetyl-N'-(2RS,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-4-piperidinecarboxyhydrazide.

36. A compound according to claim 19 wherein R' and R" are attached to the same nitrogen atom as a heterocyclic.
37. A compound according to claim 36 which is (2RS,3R)-3-amino-5-(ethylsulfanyl)-2-hydroxy-N-(1-piperidinyl)pentanamide.

38. A pharmaceutical composition comprising a compound of claim 1 or a therapeutically acceptable salt or prodrug thereof, in combination with a therapeutically acceptable carrier.

39. A method of inhibiting angiogenesis in a mammal in recognized need of such treatment comprising administering to the mammal a therapeutically acceptable amount of a compound of claim 1.

40. A compound which is N’-((2S,3R)-3-amino-2-hydroxy-5-(isopropylsulfanyl)pentanoyl)-3-chlorobenzoyl hydrazide.