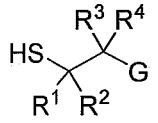
WHAT IS CLAIMED:

1. Use of a composition in the manufacture of a medicament for treating a patient suffering from a disease for which treatment with cysteamine is indicated , wherein the composition comprises a compound of formula I or a disulfide thereof:



(I)

wherein:

R^1 and R^2 are independently selected from the group consisting of H and $C_{1\text{-}5}$alkyl; or

R^1 and R^2, taken together with the carbon atom to which they are attached, form a 3-, 4-, 5-, 6-, 7-, or 8-membered carbocyclic ring;

R^3 and R^4 are independently selected from the group consisting of H and $C_{1\text{-}5}$alkyl; or

R^3 and R^4, taken together with the carbon atom to which they are attached, form a 3-, 4-, 5-, 6-, 7-, or 8-membered carbocyclic ring;

G is selected from the group consisting of —NR^5R^6 and —$CR^7R^8NR^5R^6$;

R^5 and R^6 are independently selected from the group consisting of H and $C_{1\text{-}5}$alkyl; or

R^5 and R^6, taken together with the nitrogen atom to which they are attached, form a 3-, 4-, 5-, 6-, 7-, or 8-membered heterocyclic ring;

R^7 and R^8 are independently selected from the group consisting of H and $C_{1\text{-}5}$alkyl; or

R^7 and R^8, taken together with the carbon atom to which they are attached, form a 3-, 4-, 5-, 6-, 7-, or 8-membered carbocyclic ring;

R^2 and R^6, taken together with the atoms to which they are attached, form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocyclic ring;

R^4 and R^6, taken together with the atoms to which they are attached, form a 4-, 5-, 6-, 7-, 8-, 9-, or 10-membered heterocyclic ring;

R^2 and R^8, taken together with the atoms to which they are attached, form a 3-, 4-, 5-, 6-, 7-, or 8-membered carbocyclic ring; or

R^2 and R^4, taken together with the atoms to which they are attached, form a 3-, 4-, 5-, 6-, 7-, or 8-membered carbocyclic ring;

with the proviso that when G is —NH_2, at least one of R^1, R^2, R^3, and R^4 is other than H.

2. The use of claim 1, wherein R^5 and R^6 are independently selected from the group consisting of H, methyl, and ethyl.

3. The use of claim 1, wherein R^5 and R^6, taken together with the nitrogen atom to which they are attached, form a 5-membered heterocyclic ring.

4. The use of any one of the preceding claims, wherein R^4 is methyl.

5. The use of claim 4, wherein R^3 is methyl.

6. The use of any one of claims 1-3, wherein R^3 and R^4, taken together with the carbon atom to which they are attached, form a 3-membered carbocyclic ring.

7. The use of any one the preceding claims, wherein R^2 is methyl.

8. The use of claim 7, wherein R^1 is methyl.

9. The use of any one of claims 1-6, wherein R^1 and R^2, taken together with the carbon atom to which they are attached, form a 3-membered carbocyclic ring.

10. The use of claim 1, wherein G is —$CR^7R^8NR^5R^6$, and R^2 and R^6, taken together with the atoms to which they are attached, form a 6-membered heterocyclic ring.

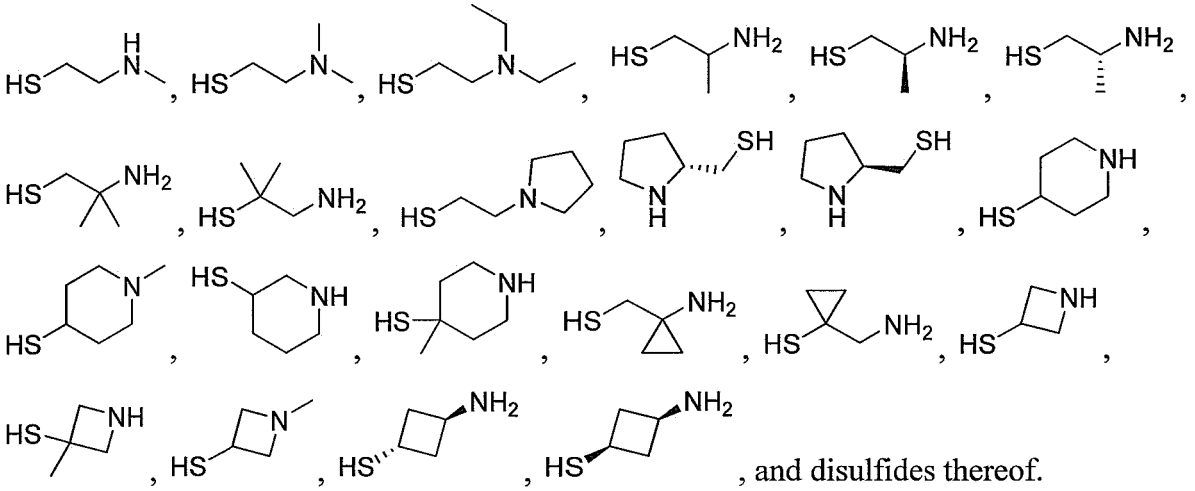
11. The use of claim 10, wherein R^5 is methyl.

12. The use of claim 1, wherein G is —NR^5R^6, and R^2 and R^6, taken together with the atoms to which they are attached, form a 4- or 6-membered heterocyclic ring.

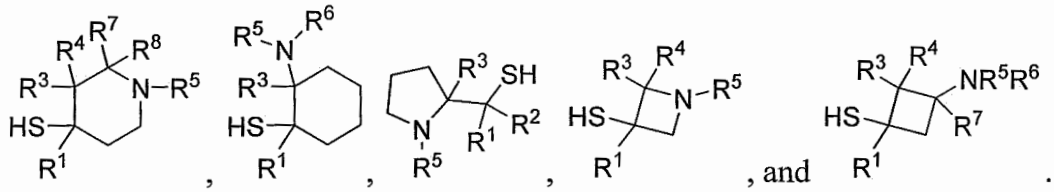
13. The use of claim 12, wherein R^5 is H.

14. The use of any one the preceding claims, wherein R^7 and R^8 are both H.

15. The use of claim 1, wherein the compound of formula I is selected from the group consisting of:



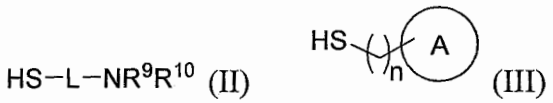
16. The use of claim 1, wherein the compound of formula I is selected from the group consisting of:



17. The use of claim 16, wherein R^1, R^2, R^3, R^4, R^5, R^6, R^7, and R^8 are independently selected from the group consisting of H and $C_{1\text{-}5}$alkyl.

18. The use of claim 16, wherein R^1, R^2, R^3, R^4, R^5, R^6, R^7, and R^8 are independently selected from the group consisting of H and methyl.

19. Use of a composition in the manufacture of a medicament for treating a patient suffering from a disease for which treatment with cysteamine is indicated, wherein the composition comprises a compound of formula II, formula III, or a disulfide thereof:



wherein:

L is a hydrocarbon linking group;

R^9 and R^{10} are independently selected from the group consisting of H, $C_{1\text{-}5}$alkyl, and $CO(C_{1\text{-}5}$alkyl); or

R^9 and R^{10}, taken together with the nitrogen atom to which they are attached, form a 3-, 4-, 5-, 6-, 7-, or 8-membered heterocyclic ring;

A is a heterocyclic ring contain one N atom; and

n is 0, 1, 2, or 3;

wherein the S atom in the compound of formula II or formula III is a distance of about 3.6 Angstroms to about 4.7 Angstroms from the N atom in the compound;

with the proviso that the compound of formula II is not cysteamine.

20. The use of claim 19 wherein L is a 3-, 4-, 5-, 6-, 7-, or 8-membered cycloalkyl ring or a 6-membered aryl ring.

21. The use of claim 19 wherein L is $C_{1\text{-}5}$alkyl.

22. The use of any one of claims 19-21 wherein L is substituted with one to four groups selected from halo, $C_{1\text{-}5}$alkyl, $C_{3\text{-}5}$cycloalkyl, and —$CO_2(C_{1\text{-}5}$alkyl).

23. The use of claim 19 wherein A is a 3-, 4-, 5-, 6-, 7-, or 8-membered monocyclic heterocycloalkyl ring, a 6-, 7-, or 8-membered bicyclic heterocycloalkyl ring, or a 5- or 6-membered heteroaryl ring.

24. The use of claim 19 wherein the compound of formula III has a structure IIIa:



(IIIa)

wherein R^{11} is selected from the group consisting of H and $C_{1\text{-}5}$alkyl.

25. The use of any one of claims 19, 23, or 24 wherein A is substituted with one to four groups selected from halo, $C_{1\text{-}5}$alkyl, $C_{3\text{-}5}$cycloalkyl, and —$CO_2(C_{1\text{-}5}$alkyl).

26. The use of claim 19 wherein the S atom in the compound of formula II or formula III is a distance of about 3.8 Angstroms to about 4.4 Angstroms from the N atom in the compound.

27. The use of claim 26 wherein the S atom in the compound of formula II or formula III is a distance of about 4.0 Angstroms to about 4.2 Angstroms from the N atom in the compound.

28. The use of claim 27 wherein the S atom in the compound of formula II or formula III is a distance of about 4.1 Angstroms from the N atom in the compound.

29. The use of any one of claims 19-28 wherein the compound of formula II, formula III, or disulfide thereof depletes cystine in a subject in an amount that is at least 70% of the level of depletion of cystine by cysteamine.

30. The use of any one of claims 1-29, wherein the compound of formula I, formula II, formula III, or disulfide thereof is resistant to metabolism by cysteamine dioxygenase (ADO).

31. The use of claim 30, wherein less than 20% of the compound of formula I, formula II, formula III, or disulfide thereof is metabolized by ADO when assayed by consumption of oxygen using an oxygen sensitive fluorescent probe.

32. The use of any one of claims 1-31 wherein the disease is selected from the group consisting of cystinosis, fatty liver disease, fibrosis, a thrombotic disease, an MECP-2 related disorder, an inherited mitochondrial disease, a neurological disease or disorder, inflammation and cancer.

33. The use of claim 32 wherein the fatty liver disease is selected from the group consisting of non-alcoholic fatty liver disease (NAFLD), non-alcoholic steatohepatitis (NASH), fatty liver disease resulting from hepatitis, fatty liver disease resulting from obesity, fatty liver disease resulting from diabetes, fatty liver disease resulting from insulin resistance, fatty liver disease resulting from hypertriglyceridemia, Abetalipoproteinemia, glycogen storage diseases, Weber-Christian disease, Wolmans disease, acute fatty liver of pregnancy, and lipodystrophy.

34. The use of claim 32 wherein the fibrosis is selected from the group consisting of atherosclerosis, asthma, cardiac fibrosis, organ transplant fibrosis, colloid and hypertrophic scar, muscle fibrosis, pancreatic fibrosis, bone-marrow fibrosis, interstitial liver fibrosis, cirrhosis of liver and gallbladder, scleroderma, pulmonary fibrosis, diffuse parenchymal lung disease, idiopathic interstitial fibrosis, interstitial pneumonitis, desquamative interstitial pneumonia, respiratory bronchiolitis, interstitial lung disease, acute interstitial pneumonitis, nonspecific interstitial pneumonia, cryptogenic organizing pneumonia, lymphocytic interstitial pneumonia, renal fibrosis, and chronic kidney disease, cystic fibrosis and Alport's disease.

35. The use of claim 32 wherein the thrombotic disease is selected from the group consisting of sickle cell disease, deep vein thrombosis, pulmonary embolism, cardiac embolism, hypercoagulable state, thrombophilia, Factor V Leiden, Antithrombin III deficiency, Protein C deficiency, Protein S deficiency, Prothrombin gene mutation (G20210A), Hyperhomcysteinemia, antiphospholipid antibody syndrome (APS), anticardiolipin antibody (ACLA) thrombosis syndrome, or lupus anticoagulant (LA) syndrome.

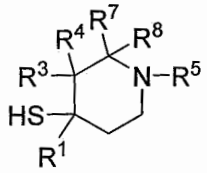
36. The use of claim 32 wherein the neurological disease or disorder is selected from the group consisting of Huntington's Disease, Parkinson's Disease, amyotrophic lateral sclerosis, multiple sclerosis, Alzheimer's disease spinal muscle atrophy, concussion, stroke, and traumatic brain injury (CTE).

37. The use of claim 32 wherein the MECP-2 related disease is selected from the group consisting of Rett syndrome, autism, pervasive development disorder, non-syndromic mental retardation, idiopathic neonatal encephalopathy and idiopathic cerebral palsy.

38. The use of claim 32 wherein the inherited mitochondrial disease is selected from the group consisting of Friedreich's ataxia, Leber's hereditary optic neuropathy (LHON), myoclonic epilepsy and ragged-red fibers, mitochondrial encephalomyopathy, lactic acidosis, and stroke-like syndrome (MELAS), Kearn-Sayre syndrome and subacute necrotizing encephalopathy (Leigh's Syndrome).

39. The use of claim 32 wherein the cancer is selected from the group consisting of breast cancer, melanoma, prostate cancer, pancreatic cancer, head and neck cancer, lung cancer, non small-cell lung carcinoma, renal cancer, colorectal cancer, colon cancer, ovarian cancer, liver cancer and gastric cancer.

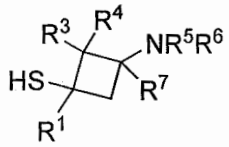
40. A compound having the following structure or a disulfide thereof:



wherein R^1 is $C_{1\text{-}5}$alkyl; and

R^3, R^4, R^5, R^7, and R^8 are independently selected from the group consisting of H and $C_{1\text{-}5}$alkyl.

41. A compound having the following structure or a disulfide thereof:



wherein R^1, R^3, R^4, R^5, R^6, and R^7 are independently selected from the group consisting of H and $C_{1\text{-}5}$alkyl.