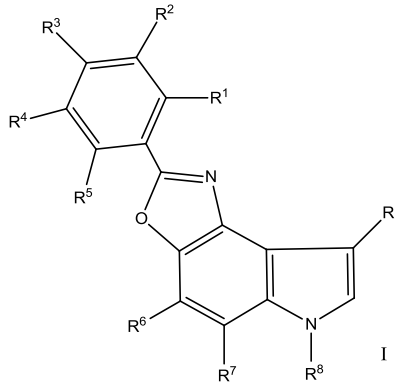
WHAT IS CLAIMED IS:

1. An immunogenic ~~A~~ compound of Formula I for antibody production:



I

wherein: R is a member selected from the group consisting of alkyl, alkoxy, alkoxyalkyl, aminoalkyl, amidoalkyl, carboxyalkyl, substituted carboxyalkyl; and

R^1, R^2, R^3, R^4, R^5, R^6, R^7, and R^8 are each a member independently selected from the group consisting of hydrogen, alkyl, halo, hydroxyl, alkoxy, amino, aroyl, alkanoyl, amido, substituted amido, cyano, carboxyl, alkoxycarbonyl, sulfonato, alkoxyalkyl, carboxy, carboxyalkyl, alkoxycarbonylalkyl, sulfonatoalkyl, L and $R^{11}B$;

L is a linker;

R^{11} is the resultant attachment between the compound and a biomolecule; and

B is a biomolecule, which is a protein or an immunogenic peptide; wherein at least one member of the group of R^1, R^2, R^3, R^4, R^5, R^6, and R^7 is $R^{11}B$.

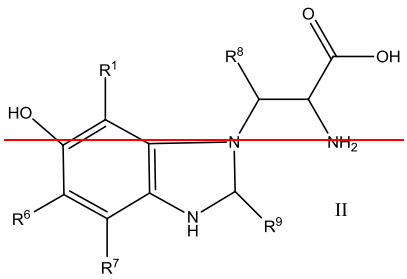
2. The compound of claim **1**, wherein R is a member selected from the group consisting of aminoalkyl, carboxyalkyl, and substituted carboxyalkyl.

3. The compound of claim **1**, wherein R is a member selected from the group consisting of $-CH_2CH_2NH_2$, $-CH_2CH_2CO_2H$ and $-CH_2CH(NH_2)CO_2H$.

4. The compound of claim **1**, wherein at least one member of the group of R^1, R^2, R^3, R^4, R^5, R^6, and R^7 is $R^{11}B$.

~~**5**. The compound of claim **4**, wherein B is a member selected from the group consisting of a protein, an immunogenic peptide and biotin.~~

~~**6**. A compound of Formula II:~~



II

wherein R^1, R^6, R^7, R^8, and R^9 are each a member independently selected from the group consisting of hydrogen, alkyl, halo, hydroxyl, alkoxy, amino, aroyl, alkanoyl, amido, substituted amido, cyano, carboxyl, alkoxycarbonyl, sulfonato, alkoxyalkyl, carboxy, carboxyalkyl, alkoxycarbonylalkyl, sulfonatoalkyl, L and R^{11}B;

L is a linker;

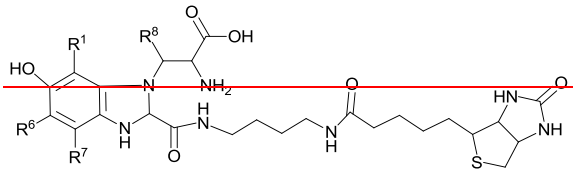
R^{11} is the resultant attachment between the compound and a biomolecule; and

B is a biomolecule.

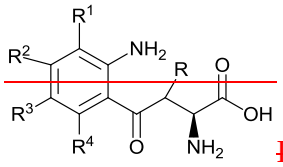
7. The compound of claim **6**, wherein at least one member of the group of R^1, R^6, R^7, R^8, and R^9 is R^{11}B.

8. The compound of claim **7**, wherein B is a member selected from the group consisting of a protein, an immunogenic peptide or biotin.

9. The compound of claim **8**, wherein said compound has the formula:



10. A compound of Formula III:



III

wherein R, R^1, R^2, R^3, and R^4 are each a member independently selected from the group consisting of hydrogen, alkyl, halo, hydroxyl, alkoxy, amino, aroyl, alkanoyl, amido, substituted amido, cyano, carboxyl, alkoxycarbonyl, sulfonato, alkoxyalkyl, carboxy, carboxyalkyl, alkoxycarbonylalkyl, sulfonatoalkyl, L and R^{11}B;

L is a linker;

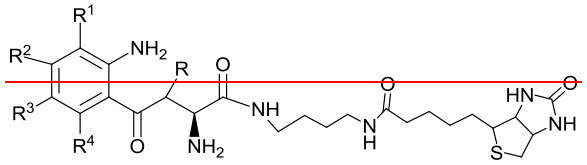
R^{11} is the resultant attachment between the compound and a biomolecule; and

B is a biomolecule.

11. The compound of claim **10**, wherein at least one member of the group of R, R^1, R^2, R^3, and R^4 is $R^{11}B$.

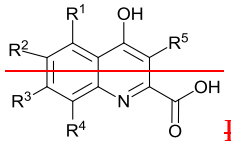
12. The compound of claim **11**, wherein B is a member selected from the group consisting of a protein, an immunogenic peptide or biotin.

13. The compound of claim **12**, wherein the compound has the formula:



wherein R, R^1, R^2, R^3, and R^4 are each hydrogen.

14. A compound of Formula IV:



IV

wherein R^1, R^2, R^3, R^4 and R^5 are each a member independently selected from the group consisting of hydrogen, alkyl, halo, hydroxyl, alkoxy, amino, aroyl, alkanoyl, amido, substituted amido, cyano, carboxyl, alkoxycarbonyl, sulfonato, alkoxyalkyl, carboxy, carboxyalkyl, alkoxycarbonylalkyl, sulfonatoalkyl L and $R^{11}B$;

L is a linker;

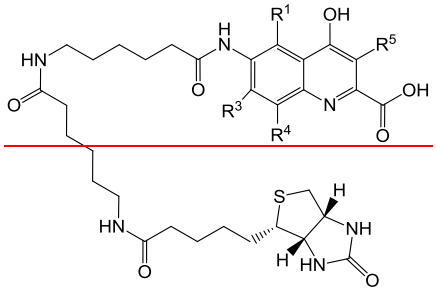
R^{11} is the resultant attachment between the compound and a biomolecule; and

B is a biomolecule.

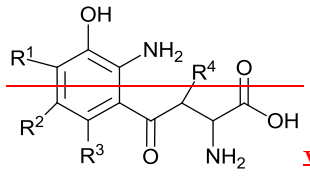
15. The compound of claim **14**, wherein at least one member of the group of R^1, R^2, R^3, R^4 and R^5 is $R^{11}B$.

16. The compound of claim **15**, wherein B is a member selected from the group consisting of a protein, an immunogenic peptide or biotin.

17. The compound of claim **16**, wherein the compound as the formula:



18. A compound of Formula V:



V

wherein R^1, R^2, R^3, and R^4 are each a member independently selected from the group consisting of hydrogen, alkyl, halo, hydroxyl, alkoxy, amino, aroyl, alkanoyl, amido, substituted amido, cyano, carboxyl, alkoxycarbonyl, sulfonato, alkoxyalkyl, carboxy, carboxyalkyl, alkoxycarbonylalkyl, sulfonatoalkyl, L and R^{11}B;

L is a linker; and

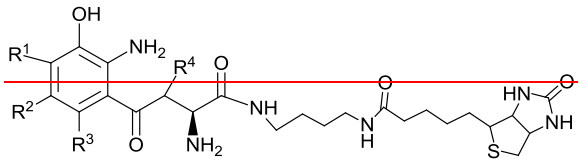
R^{11} is the resultant attachment between the compound and a biomolecule; and

B is a biomolecule.

19. The compound of claim **18**, wherein at least one member of the group of R^1, R^2, R^3 and R^4 is R^{11}B.

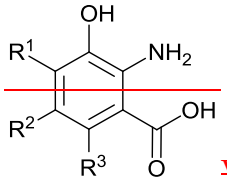
20. The compound of claim **19**, wherein B is a member selected from the group consisting of a protein, an immunogenic peptide and biotin.

21. The compound of claim **20**, wherein the compound has the formula:



wherein R^1, R^2, R^3, and R^4 are each hydrogen.

22. A compound of Formula VI:



VI

wherein R^1, R^2, and R^3 are each a member independently selected from the group consisting of hydrogen, alkyl, halo, hydroxyl, alkoxy, amino, aroyl, alkanoyl, amido, substituted amido, cyano, carboxyl, alkoxycarbonyl, sulfonato, alkoxyalkyl, carboxy, carboxyalkyl, alkoxycarbonylalkyl, sulfonatoalkyl, L and R^{11}B;

L is a linker;

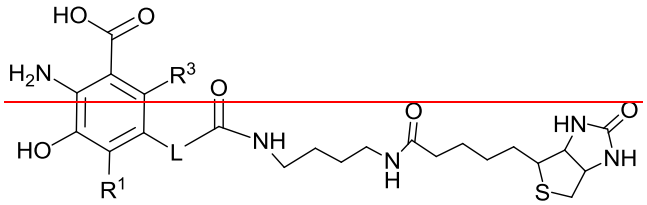
R^{11} is the resultant attachment between the compound and a biomolecule; and

B is a biomolecule.

23. The compound of claim **22**, wherein at least one member of the group of R^1, R^2, R^3 and R^4 is R^{11}B.

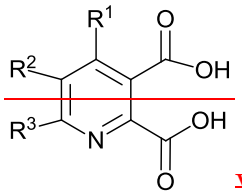
24. The compound of claim **23**, wherein B is a member selected from the group consisting of a protein, an immunogenic peptide or biotin.

25. The compound of claim **24**, wherein the compound has the formula:



wherein R^1 and R^3 are each hydrogen.

26. A compound of Formula VII:



VII

wherein R^1, R^2, and R^3 are each a member independently selected from the group consisting of hydrogen, alkyl, halo, hydroxyl, alkoxy, amino, aroyl, alkanoyl, amido, substituted amido, cyano, carboxyl, alkoxycarbonyl, sulfonato, alkoxyalkyl, carboxy, carboxyalkyl, alkoxycarbonylalkyl, sulfonatoalkyl, L and R^{11}B.

L is a linker; and

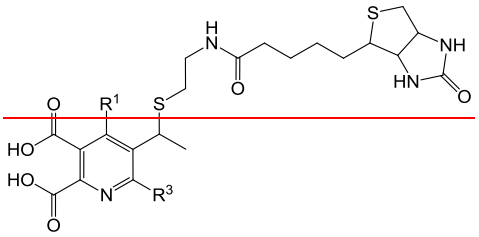
R^{11} is the resultant attachment between the compound and a biomolecule; and

B is a biomolecule.

27. The compound of claim **26**, wherein at least one member of the group of R^1, R^2, and R^3 is R^{11}B.

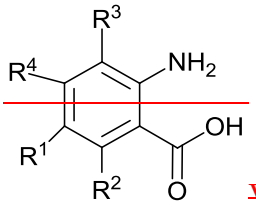
28. The compound of claim **27**, wherein B is a member selected from the group consisting of a protein, an immunogenic peptide and biotin.

29. The compound of claim **28**, wherein the compound has the formula:



wherein R^1 and R^3 are each hydrogen.

30. A compound of Formula VIII:



VIII

wherein R^1, R^2, R^3, and R^4 are each a member independently selected from the group consisting of hydrogen, alkyl, halo, hydroxyl, alkoxy, amino, aroyl, alkanoyl, amido, substituted amido, cyano, carboxyl, alkoxycarbonyl, sulfonato, alkoxyalkyl, carboxy, carboxyalkyl, alkoxycarbonylalkyl, sulfonatoalkyl, L and R^{11}B;

L is a linker; and

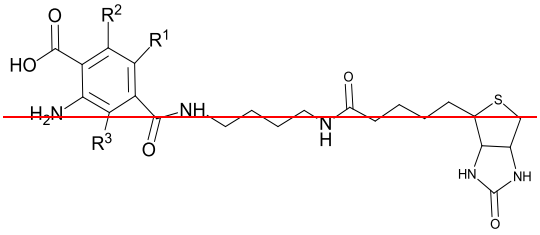
R^{11} is the resultant attachment between the compound and a biomolecule; and

B is a biomolecule.

31. The compound of claim **30**, wherein at least one member of the group of R^1, R^2, and R^3 is R^{11}B.

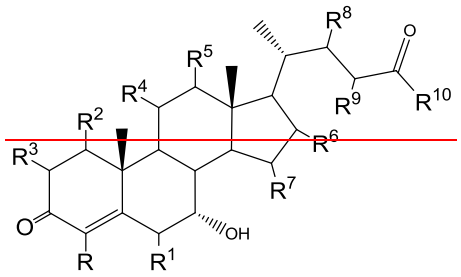
32. The compound of claim **31**, wherein B is a member selected from the group consisting of a protein, an immunogenic peptide or biotin.

33. The compound of claim **32**, wherein the compound has the formula:



wherein R^1, R^2, and R^3 are each hydrogen.

34. A compound of Formula X:



wherein R, R^1, R^2, R^3 R^4, R^5, R^6 R^7, R^8, R^9 and R^{10} are each a member independently selected from the group consisting of hydrogen, alkyl, halo, hydroxyl, alkoxy, amino, aroyl, alkanoyl, amido, substituted amido, cyano, carboxyl, alkoxycarbonyl, sulfonato, alkoxyalkyl, carboxy, carboxyalkyl, alkoxycarbonylalkyl, sulfonatoalkyl, L and R^{11}B;

L is a linker;

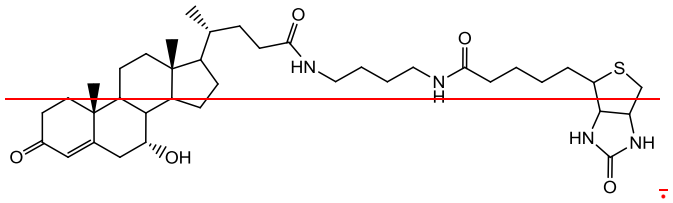
R^{11} is the resultant attachment between the compound and a biomolecule; and

B is a biomolecule.

35. The compound of claim **34**, wherein at least one member of the group of R^1, R^2, and R^3 is R^{11}.

36. The compound of claim **35**, wherein B is a member selected from the group consisting of a protein, an immunogenic peptide or biotin.

37. The compound of claim **36**, wherein the compound has the formula:



~~**38**. An isolated antibody or antigen binding fragment thereof that specifically binds to 5-hydroxytryptamine (5-HT), wherein said antibody has less than 1% cross-reactivity to a member selected from the group consisting of tryptophan, 5-hydroxytryptophan and 5-hydroxyindole acetic acid~~

~~**39**. An isolated antibody or antigen binding fragment thereof that specifically binds to 5-hydroxytryptophan (5-OH), wherein said antibody has less than 1% cross-reactivity to one or more members selected from the group consisting of tryptophan, 5-hydroxytryptamine and 5-hydroxyindole acetic acid~~

~~**40**. An isolated antibody or antigen binding fragment thereof that specifically binds to 5-tryptophan, wherein said antibody has less than 1% cross-reactivity to one or more members selected from the group consisting of 5-hydroxytryptophan, 5-hydroxytryptamine and 5-hydroxyindole acetic acid.~~

~~**41**. An isolated antibody or antigen binding fragment thereof that specifically binds to 5-hydroxyindole acetic acid, wherein said antibody has less than 1% cross-reactivity to one or more members selected from the group consisting of tryptophan, 5-hydroxytryptophan, and 5-hydroxytryptamine.~~

~~**42**. An isolated antibody or antigen binding fragment thereof that specifically binds to kynurenine, wherein said antibody has less than 1% cross-reactivity to one or more members selected from the group consisting of kynurenic acid, 3-hydroxykynurenine, 3-hydroxyanthranilic acid, quinolinic acid, anthranilic acid, serotonin-O-sulfate and serotonin-O-phosphate.~~

~~**43**. An isolated antibody or antigen binding fragment thereof that specifically binds to kynureninic acid, wherein said antibody has less than 1% cross-reactivity to one or more members selected from the group consisting of kynurenine, 3-hydroxykynurenine, 3-hydroxyanthranilic acid, quinolinic acid, anthranilic acid, serotonin-O-sulfate and serotonin-O-phosphate.~~

~~**44**. An isolated antibody or antigen binding fragment thereof that specifically binds to 3-hydroxykynurenine, wherein said antibody has less than 1% cross-reactivity to one or more members selected from the group consisting of kynurenine, kynurenic acid, 3-hydroxyanthranilic acid, quinolinic acid, anthranilic acid, serotonin-O-sulfate and serotonin-O-phosphate.~~

~~**45**. An isolated antibody or antigen binding fragment thereof that specifically binds to 3-hydroxyanthranilic acid, wherein said antibody has less than 1% cross-reactivity to one or more members selected from the group consisting of kynurenine, kynurenic acid, 3-hydroxykynurenine, quinolinic acid, anthranilic acid, serotonin-O-sulfate and serotonin-O-phosphate.~~

~~**46**. An isolated antibody or antigen binding fragment thereof that specifically binds to quinolinic acid, wherein said antibody has less than 1% cross-reactivity to one or more members selected from the group consisting of kynurenine, kynureninic acid, 3-hydroxykynurenine, 3-hydroxyanthranilic acid, anthranilic acid, serotonin-O-sulfate and serotonin-O-phosphate.~~

~~**47**. An isolated antibody or antigen binding fragment thereof that specifically binds to anthranilic acid, wherein said antibody has less than 1% cross-reactivity to one or more members selected from the group consisting of kynurenine, kynureninic acid, 3-hydroxykynurenine, 3-hydroxyanthranilic acid, quinolinic acid, serotonin-O-sulfate and serotonin-O-phosphate.~~

~~**48**. An isolated antibody or antigen binding fragment thereof that specifically binds to serotonin-O-sulfate, wherein said antibody has less than 1% cross-reactivity to one or more members selected from the group consisting of kynurenine, kynureninic acid, 3-hydroxykynurenine, 3-hydroxyanthranilic acid, quinolinic acid, anthranilic acid, and serotonin-O-phosphate.~~

~~**49**. An isolated antibody or antigen binding fragment thereof that specifically binds to serotonin-O-phosphate, wherein said antibody has less than 1% cross-reactivity to one or more members selected from the group consisting of kynurenine, kynureninic acid, 3-hydroxykynurenine, 3-hydroxyanthranilic acid, quinolinic acid, anthranilic acid, and serotonin-O-sulfate.~~

50. An isolated antibody or antigen binding fragment thereof that specifically binds to 7-α-hydroxy-4-cholesten-3-one derivative, wherein said antibody has less than 1% cross-reactivity to a member selected from the group consisting of cholesterol and 7-α-cholesterol.

51. An isolated antibody or antigen binding fragment thereof that specifically binds to propionic acid, wherein said antibody has less than 1% cross-reactivity to butyric acid.

52. An isolated antibody or antigen binding fragment thereof that specifically binds to butyric acid, wherein said antibody has less than 1% cross-reactivity to propionic acid.

53. The antibody or fragment thereof according to any one of claims **38-52**, wherein the antibody is a polyclonal or monoclonal antibody.

54. The antibody or fragment thereof according to claim **53**, wherein the polyclonal antibody is a rabbit antibody.

55. The antibody or fragment thereof according to any one of claims **38-52**, wherein the antibody is a Fab or Fab2 fragment.

56. The antibody or fragment thereof according to any one of claims **38-52**, wherein the antibody is a recombinant antibody.

57. A method for assaying a metabolite selected from the group consisting of serotonin (5-HT), 5-hydroxyindole acetic acid (5-HIAA), 5-hydroxy tryptophan (5-HTP), kynurenine (K), kynurenic acid (KA), 3-hydroxykynurenine (3-HK), 3-hydroxyanthranilic acid (3-HAA), quinolinic acid, anthranilic acid and a combination thereof in a fluid or tissue sample from a mammal, the method comprising:

admixing the sample with antibodies that specifically bind to a metabolite selected from the group consisting of serotonin (5-HT), 5-hydroxyindole acetic acid (5-HIAA), 5-hydroxy tryptophan (5-HTP), kynurenine (K), kynurenic acid (KA), 3-hydroxykynurenine (3-HK), 3-hydroxyanthranilic acid (3-HAA), quinolinic acid, anthranilic acid and a combination thereof; and

~~determining whether the antibodies specifically bind to the metabolite, wherein specific antibody binding indicates that the metabolite is present in the sample.~~

~~**58**. A method for assaying 7-α-hydroxy-4-cholesten-3-one in a fluid or tissue sample from a mammal, the method comprising:~~

~~admixing the sample with antibodies that specifically bind to 7-α-hydroxy-4-cholesten-3-one; and~~

~~determining whether the antibodies specifically bind to 7-α-hydroxy-4-cholesten-3-one, wherein specific antibody binding indicates that the metabolite is present in the sample.~~

~~**59**. A method for assaying a metabolite selected from the group consisting of propionic acid and butyric acid and a combination thereof in a fluid or tissue sample from a mammal, the method comprising:~~

~~admixing the sample with antibodies that specifically bind to a metabolite selected from the group consisting of propionic acid and butyric acid and a combination thereof; and~~

~~determining whether the antibodies specifically bind to the metabolite, wherein specific antibody binding indicates that the metabolite is present in the sample.~~

5. A method for making antibodies, the method comprising:

(a) providing an immunogen comprising a derivative of 5-hydroxy tryptophan (5-HTP) according to claims 1-4;

(b) immunizing an animal with the immunogen under conditions such that the immune system of the animal makes the antibodies; and

(c) removing the antibodies from the animal.

6. The method of claim 5, wherein the animal is a member selected from the group consisting of a rabbit, a mouse, a sheep, chicken, and a goat.

7. An antibody made by the method of claim 5.

8. The antibody or fragment thereof of claim 7, wherein the antibody is a polyclonal or monoclonal antibody.

9. The antibody or fragment thereof of claim 8, wherein the polyclonal antibody is a rabbit antibody.

10. The antibody or fragment thereof of claim 8, wherein the antibody is a Fab or Fab2 fragment.

11. The antibody or fragment thereof of claim 7, wherein the antibody is a recombinant antibody.

12. The antibody or fragment thereof of any one of claims 7-11, which antibody or fragment thereof specifically binds to 5-hydroxytryptamine (5-HT), wherein said antibody has less than 1% cross-reactivity to a member selected from the group consisting of tryptophan, 5-hydroxytryptophan and 5-hydroxyindole acetic acid.

13. The antibody or fragment thereof of any one of claims 7-11, which antibody or fragment thereof specifically binds to 5-hydroxytryptophan (5-OH), wherein said antibody has less than 1% cross-reactivity to one or more members selected from the group consisting of tryptophan, 5-hydroxytryptamine and 5-hydroxyindole acetic acid

14. The antibody or fragment thereof of any one of claims 7-11, which antibody or fragment thereof specifically binds to 5-tryptophan, wherein said antibody has less than 1% cross-reactivity to one or more members selected from the group consisting of 5-hydroxytryptophan, 5-hydroxytryptamine and 5-hydroxyindole acetic acid.

15. The antibody or fragment thereof of any one of claims 7-11, which antibody or fragment thereof specifically binds to 5-hydroxyindole acetic acid, wherein said antibody has less than 1% cross-reactivity to one or more members selected from the group consisting of tryptophan, 5-hydroxytryptophan, and 5-hydroxytryptamine.

16. A method for assaying a metabolite selected from the group consisting of serotonin (5-HT), 5-hydroxyindole acetic acid (5-HIAA), 5-hydroxy tryptophan (5-HTP), and a combination thereof in a fluid or tissue sample from a mammal, the method comprising:

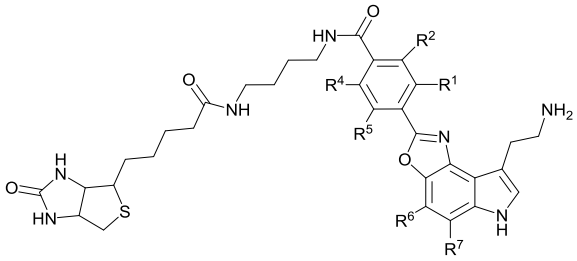
admixing the sample with antibodies of any one of claims 12-15 that specifically bind to a metabolite selected from the group consisting of serotonin (5-HT), 5-

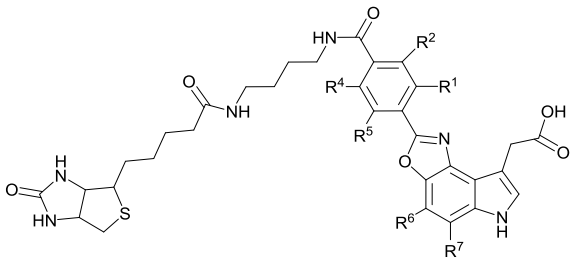
hydroxyindole acetic acid (5-HIAA), 5-hydroxy tryptophan (5-HTP), and a combination thereof; and

determining whether the antibodies specifically bind to the metabolite, wherein specific antibody binding indicates that the metabolite is present in the sample.

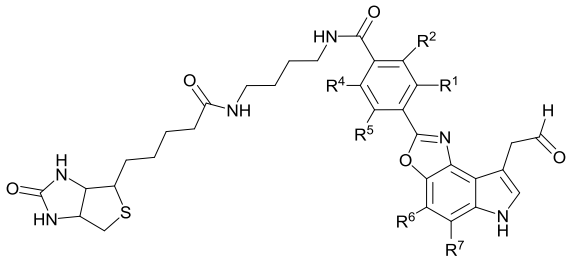
17. The method of claim 16, wherein the assay is a competitive ELISA wherein a metabolite in the sample competes with a labeled hapten.

18. The method of claim 17, wherein the labeled hapten is a member selected from the group consisting of





and



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