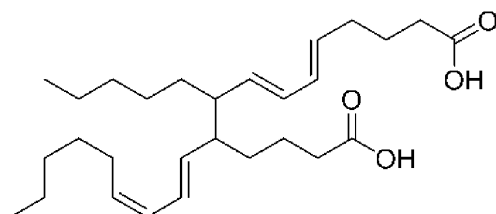
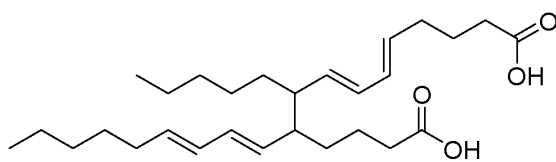


WHAT IS CLAIMED IS:

1. A compound having the structure of formula I or formula III:



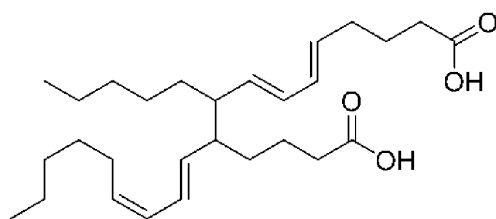
(formula I),



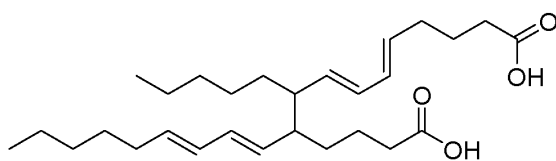
(formula III),

or a salt, ester, prodrug, or labelled derivative thereof.

2. The compound of claim 1, wherein the compound is an isolated compound.
3. The compound of claim 1 or 2, wherein the compound is a synthetically prepared compound.
4. The compound of any one of claims 1-3, wherein the compound is an analytical standard compound.
5. An isotopically labelled compound, the isotopically labelled compound comprising one or more isotopic labels incorporated within the structure of formula I or formula III:



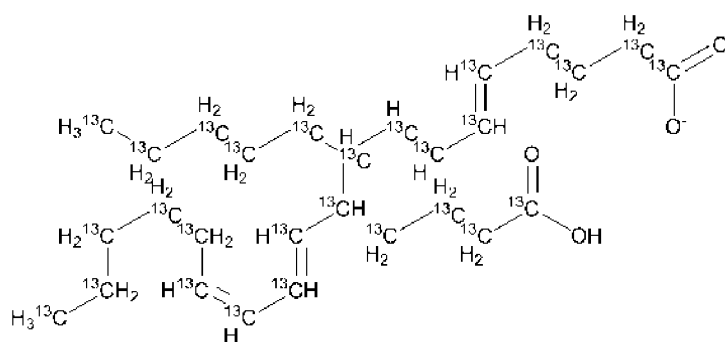
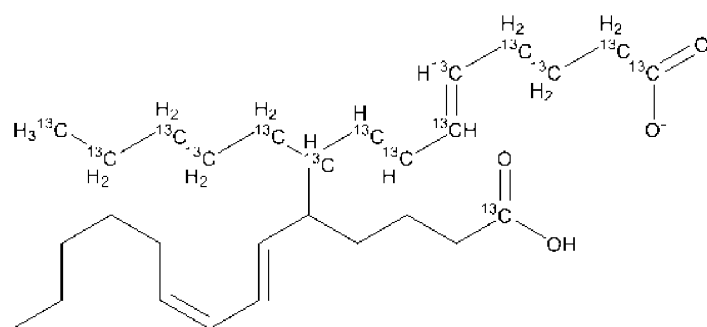
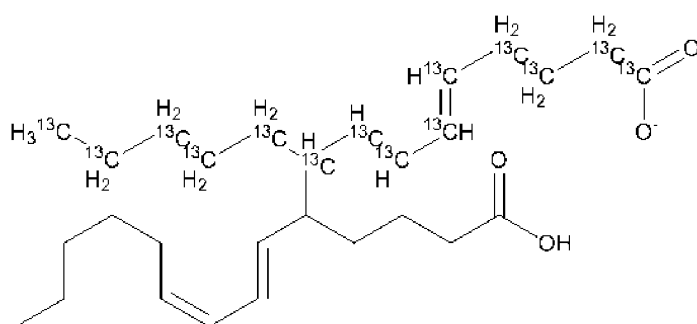
(formula I),



(formula III),

or a salt, ester, or prodrug thereof.

6. The isotopically labelled compound of claim 5, wherein the one or more isotopic labels are stable isotope labels, radioisotope labels, or a combination thereof.
7. The isotopically labelled compound of claim 5 or 6, wherein the one or more isotopic labels are selected from the group consisting of deuterium (^2H) and ^{13}C .
8. The isotopically labelled compound of claim 5 or 6, wherein the one or more isotopic labels are selected from the group consisting of tritium (^3H) and ^{14}C .
9. The isotopically labelled compound of any one of claims 5-7, wherein the isotopically labelled compound is:



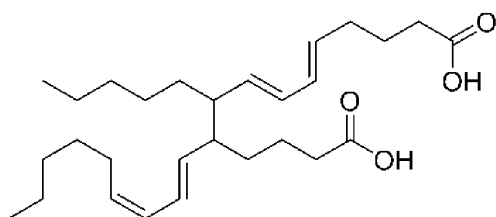
or a derivative thereof in which all carbon-carbon double bonds are in trans configuration.

or a salt, ester, or prodrug thereof.

10. The isotopically labelled compound of any one of claims 5-9, wherein the compound is an analytical standard compound.
11. A metabolic tracer composition comprising the isotopically labelled compound of any one of claims 5-9.
12. A composition comprising the compound of any one of claims 1-9, and an excipient, carrier, or diluent.
13. An *in vitro* or *in vivo* diagnostic agent comprising the isotopically labelled compound of any one of claims 5-9.
14. A composition comprising the compound of any one of claims 1-9, and an excipient, carrier, or diluent.
15. A method for determining a level of a gastric tract acid (GTA) in a sample, said method comprising:
 - measuring a GTA detection signal from the sample, the GTA detection signal representative of the GTA level in the sample; and
 - quantifying the level of the GTA in the sample by comparing the measured GTA

detection signal with a calibration reference.

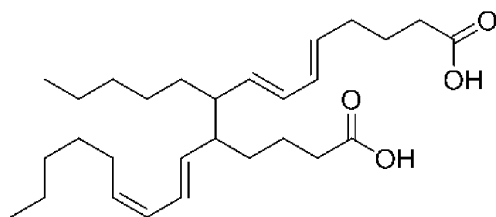
16. The method according to claim 15, wherein the GTA is



(formula I).

17. The method of claim 15 or 16, wherein the GTA detection signal is measured by mass spectrometry.
18. The method of any one of claims 15-17, wherein the calibration reference comprises a standard curve prepared using known quantities of a compound as defined in any one of claims 5-10.
19. The method of any one of claims 15-17, wherein the calibration reference is obtained by :
- spiking the sample with a known quantity of an isotopically labelled compound as defined in any one of claims 5-10; and
- measuring an internal standard signal from the sample, the internal standard signal being representative of the known quantity of the isotopically labelled compound spiked into the sample.

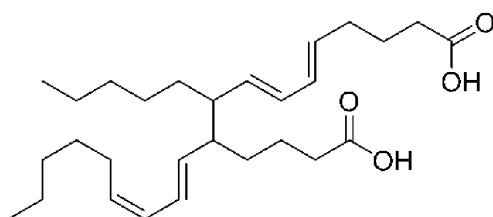
20. The method of claim 19, wherein the internal standard signal is measured by mass spectrometry.
21. The method of claim 19 or 20, further comprising a step of determining a ratio of the GTA level in the sample, as represented by the measured GTA detection signal, to the known quantity of isotopically labelled compound spiked into the sample, as represented by the internal standard signal.
22. The method of claim 21, wherein the calibration reference comprises an isotope dilution curve (IDC) generated from a series of mixtures of varying GTA/isotopically labelled compound ratios and concentrations, to which said ratio is compared.
23. The method of claim 22, wherein the IDC is generated from a series of mixtures in which GTA content is varied over a fixed amount of isotopically labelled compound.
24. The method of claim 23, wherein the fixed amount of the isotopically labelled compound is substantially the same as the known quantity of the isotopically labelled compound which is spiked into the sample.
25. Use of the compound of any one of claims 1-10 for determining a level of a gastric tract acid (GTA) in a sample.
26. The use according to claim 25, wherein the GTA is:



(formula I).

27. Use of the compound of any one of claims 1-10 for generating a calibration reference for use in determining a level of a gastric tract acid (GTA) in a sample.

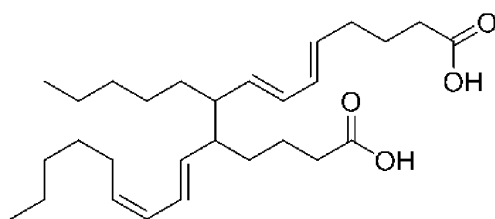
28. The use according to claim 27, wherein the GTA is:



(formula I).

29. Use of the compound of any one of claims 5-9 as an internal standard for use in determining a level of a gastric tract acid (GTA) in a sample.

30. The use according to claim 29, wherein the GTA is:



(formula I).

31. A diagnostic method for identifying a subject as having, or being at risk of developing, colorectal cancer, said method comprising:

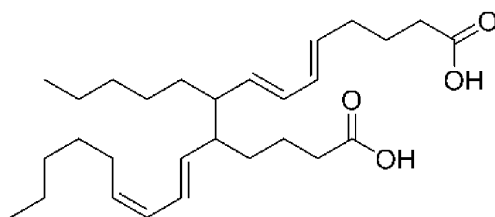
determining a level of a gastric tract acid (GTA) in a sample obtained from the subject by

measuring a GTA detection signal from the sample, the GTA detection signal representative of the GTA level in the sample; and

quantifying the level of the GTA in the sample by comparing the measured GTA detection signal with a calibration reference, and

identifying the subject as having, or being at risk of developing, colorectal cancer when the determined level of the GTA in the sample is reduced in comparison to a healthy control group,

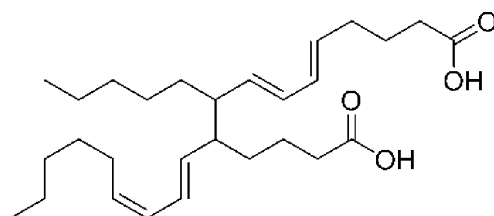
wherein the GTA is:



(formula I).

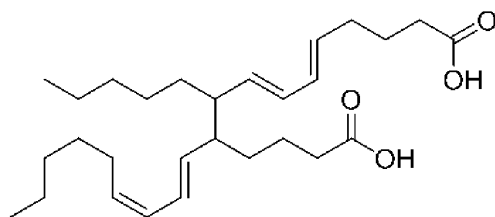
32. The method of claim 31, wherein the GTA detection signal is measured by mass spectrometry.
33. The method of claim 31 or 32, wherein the calibration reference comprises a standard curve prepared using known quantities of a compound as defined in any one of claims 5-10.
34. The method of claim 31 or 32, wherein the step of determining the level of the GTA in the sample obtained from the subject comprises:
- spiking the sample with a known quantity of an isotopically labelled compound as defined in any one of claims 5-10; and
- measuring an internal standard signal from the sample, the internal standard signal being representative of the known quantity of the isotopically labelled compound spiked into the sample.
35. The method of claim 34, wherein the internal standard signal is measured by mass spectrometry.
36. The method of claim 34 or 35, further comprising a step of determining a ratio of the GTA level in the sample, as represented by the measured GTA detection signal, to the known quantity of isotopically labelled compound spiked into the sample, as represented by the internal standard signal.

37. The method of claim 36, wherein the calibration reference comprises an isotope dilution curve (IDC) generated from a series of mixtures of varying GTA/isotopically labelled compound ratios and concentrations, to which said ratio is compared.
38. The method of claim 37, wherein the IDC is generated from a series of mixtures in which GTA content is varied over a fixed amount of isotopically labelled compound.
39. The method of claim 38, wherein the fixed amount of the isotopically labelled compound is substantially the same as the known quantity of the isotopically labelled compound which is spiked into the sample.
40. Use of the compound of any one of claims 1-10 in a diagnostic method for identifying a subject as having, or being at risk of developing, a colorectal cancer associated with altered levels of a gastric tract acid (GTA) which is:



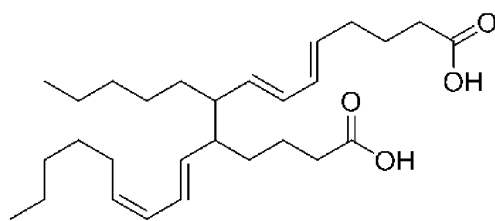
(formula I).

41. Use of the compound of any one of claims 1-10 for generating a calibration reference for use in a diagnostic method for identifying a subject as having, or being at risk of developing, a colorectal cancer associated with altered levels of a gastric tract acid (GTA) which is:



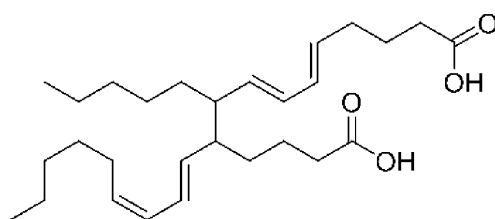
(formula I).

42. Use of the compound of any one of claims 5-9 as an internal standard for use in a diagnostic method for identifying a subject as having, or being at risk of developing, a colorectal cancer associated with altered levels of a gastric tract acid (GTA) which is:



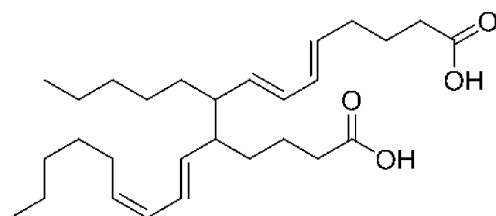
(formula I).

43. An antibody, or antigen-binding fragment thereof, which specifically binds a compound of formula I:



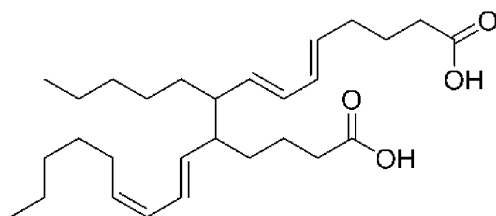
(formula I).

44. The antibody, or antigen-binding fragment thereof, of claim 43, wherein the antibody is a monoclonal or a polyclonal antibody.
45. Use of a compound according to any one of claims 1-3 as an antigen for preparing an antibody which specifically binds to an antigenic epitope of the compound.
46. Use of the antibody of claim 43 or 44 for detecting or quantifying a level of a gastric tract acid (GTA) in a sample by immunoassay, wherein the GTA is:



(formula I).

47. Use of the antibody of claim 43 or 44 in a diagnostic method for identifying a subject as having, or being at risk of developing, a colorectal cancer associated with altered levels of a gastric tract acid (GTA) which is:

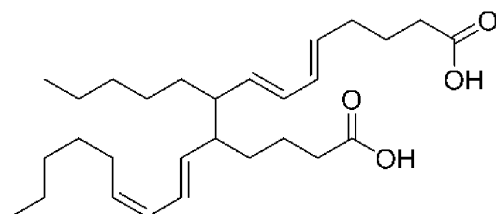


(formula I).

48. A method for determining a level of a gastric tract acid (GTA) in a sample, said method comprising:

measuring a level of the GTA in the sample using an immunoassay employing an antibody, or antigen-binding fragment thereof, which specifically binds to the GTA;

wherein the GTA is:



(formula I).

49. The method of claim 48, wherein the immunoassay comprises an enzyme-linked immunosorbent assay (ELISA).
50. The method of claim 48 or 49, further comprising a step of using a control sample comprising a compound as defined in any one of claims 1-10 as a positive control in the immunoassay.
51. The method of any one of claims 48-49, further comprising a step of using a standard curve to extrapolate the level of the GTA in the sample, the standard curve having been generated using a plurality of known quantities of a compound as defined in any one of claims 1-10.

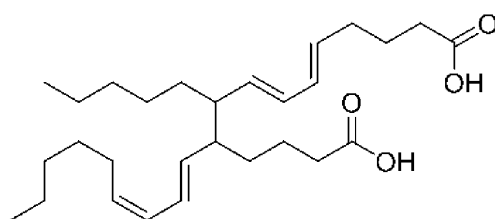
52. A diagnostic method for identifying a subject as having, or being at risk of developing, colorectal cancer, said method comprising:

determining a level of a gastric tract acid (GTA) in a sample obtained from the subject by

measuring a level of the GTA in the sample using an immunoassay employing an antibody, or antigen-binding fragment thereof, which specifically binds to the GTA; and

identifying the subject as having, or being at risk of developing, colorectal cancer when the determined level of the GTA in the sample is reduced in comparison to a healthy control group,

wherein the GTA is:



(formula I).

53. The method of claim 52, wherein the immunoassay comprises an enzyme-linked immunosorbent assay (ELISA).
54. The method of claim 52 or 53, further comprising a step of using a control sample comprising a compound as defined in any one of claims 1-10 as a positive control in the immunoassay.

55. The method of any one of claims 52-54, wherein the step of determining the level of the GTA in the sample further comprises using a standard curve to extrapolate the level of the GTA in the sample, the standard curve having been generated using a plurality of known quantities of a compound as defined in any one of claims 1-10.

56. A kit for quantifying a level of a gastric tract acid (GTA) in a sample, the kit comprising at least one of:

a compound according to any one of claims 1-10;

a metabolic tracer according to claim 11;

a composition according to claim 12 or 14;

a diagnostic agent according to claim 13; and

an antibody according to claim 43 or 44;

and, optionally, further comprising a set of instructions for performing a method as defined in any one of claims 15-24 and 48-51.

57. A diagnostic kit for identifying a subject as having, or being at risk of developing, colorectal cancer, the kit comprising at least one of:

a compound according to any one of claims 1-10;

a metabolic tracer according to claim 11;

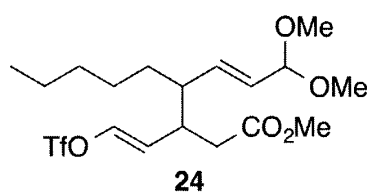
a composition according to claim 12 or 14;

a diagnostic agent according to claim 13; and

an antibody according to claim 43 or 44;

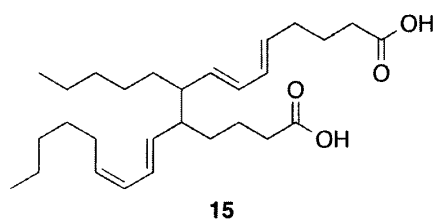
and, optionally, further comprising a set of instructions for performing a method as defined in any one of claims 31-39 and 52-55.

58. A compound having the formula:

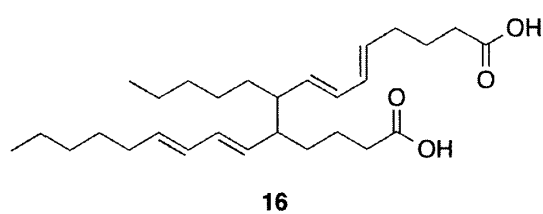


, or a labelled derivative thereof.

59. Use of the compound of claim 58 in the synthesis of a compound having the formula:



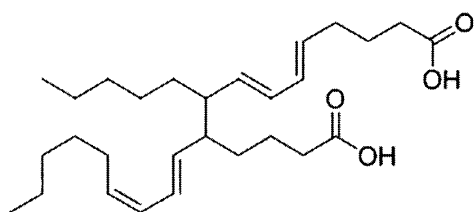
or



, or

a salt, ester, prodrug, or labelled derivative thereof.

60. A method for synthesizing a compound having formula (I):



(formula I),

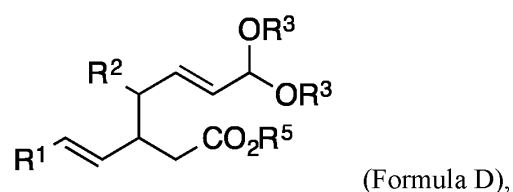
or an isotopically labelled derivative thereof,

said method comprising:

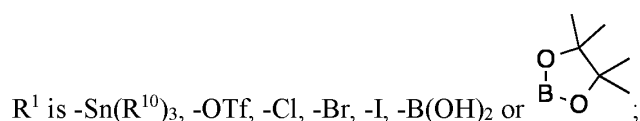
- providing a compound according to claim 58;
 - performing a Sonagashira coupling of the compound with 1-heptyne;
 - performing a reduction with Lindlar's catalyst;
 - performing a methyl ester reduction;
 - performing a reaction with methanesulfonyl chloride;
 - performing a mesylate displacement with dimethyl malonate;
 - performing an acid treatment for simultaneous acetal cleavage, ester hydrolysis, and decarboxylation; and
 - performing a Wittig reaction to yield the compound of formula I, or an isotopically labelled derivative thereof,
- wherein the compound according to claim 58, or at least one reactant in the method, comprises at least one isotopically labelled atom which is incorporated into the resulting compound of formula I when an isotopically labelled derivative of formula I is synthesized.

61. The method according to claim 60, wherein the Wittig reaction comprises reaction with (triphenylphosphoranylidene) acetaldehyde or (4-carboxybutyl)triphenylphosphonium bromide.

62. A compound having formula D:



wherein:



R² is optionally substituted saturated or unsaturated C₁-C₂₀ alkyl, saturated or unsaturated C₂-C₂₀ alkenyl, or saturated or unsaturated C₂-C₂₀ alkynyl;

each R³ is, independently, optionally substituted C₁-C₆ alkyl, or the R³ groups together form an optionally substituted ethylene or propylene group bridging the attached oxygen atoms to form a five- or six-membered ring;

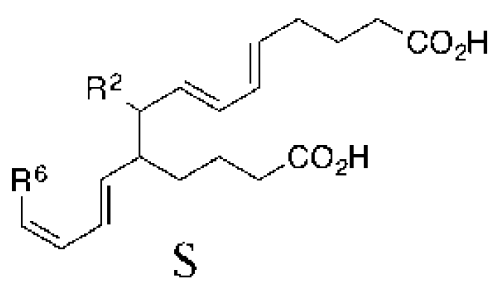
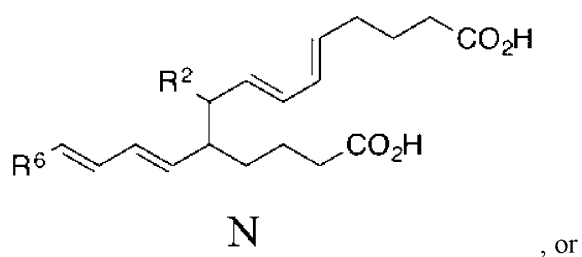
R⁵ is optionally substituted C₁-C₆ alkyl; and

R¹⁰ is optionally substituted C₁-C₆ alkyl,

or a labelled derivative thereof.

63. Use of the compound of claim 62 in the synthesis of a gastric tract acid (GTA), or a derivative thereof.

64. The use of claim 63, wherein the GTA or the derivative thereof is a compound of formula N or S:



or a salt, ester, prodrug, or labelled derivative thereof,

wherein

R^2 is optionally substituted saturated or unsaturated C_1 - C_{20} alkyl, saturated or unsaturated C_2 - C_{20} alkenyl, or saturated or unsaturated C_2 - C_{20} alkynyl; and

R^6 is optionally substituted saturated or unsaturated C_1 - C_{20} alkyl, saturated or unsaturated C_2 - C_{20} alkenyl, or saturated or unsaturated C_2 - C_{20} alkynyl.

65. A method for synthesizing a compound of formula N or S as defined in claim 64, or an isotopically labelled derivative thereof, said method comprising:

providing a compound according to claim 62;

performing a coupling reaction and, optionally, a reduction, to replace the R^1 group with an optionally substituted saturated or unsaturated alkyl, saturated or

unsaturated alkenyl, or saturated or unsaturated alkynyl;

converting the R⁵-containing ester to a hydroxyl group;

converting the hydroxyl group to a leaving group;

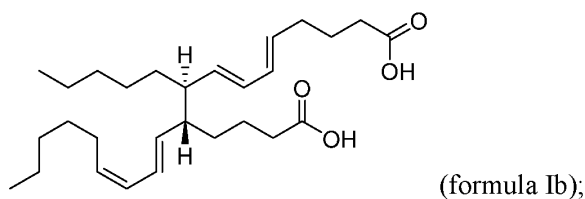
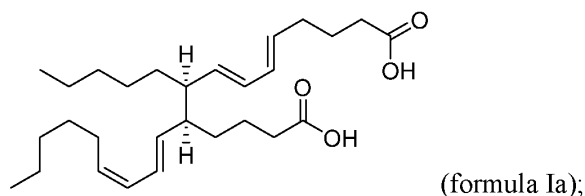
displacing the leaving group with a dialkyl malonate;

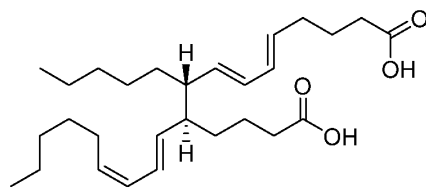
performing acetal hydrolysis, ester hydrolysis, and decarboxylation, forming an aldehyde; and

performing a coupling reaction at the aldehyde to yield the compound of formula N or S, or an isotopically labelled derivative thereof,

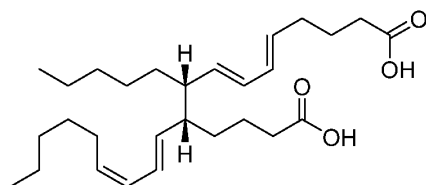
wherein the compound according to claim 62, or at least one reactant in the method, comprises at least one isotopically labelled atom which is incorporated into the resulting compound of formula N or S when an isotopically labelled derivative of formula N or S is synthesized.

66. The compound of any one of claims 1-10, wherein the compound is:

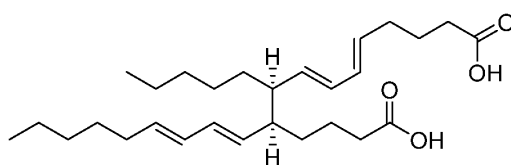




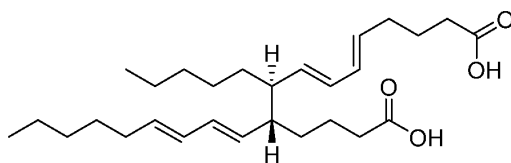
(formula Ic);



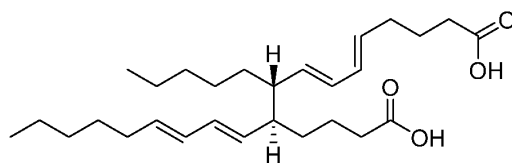
(formula Id);



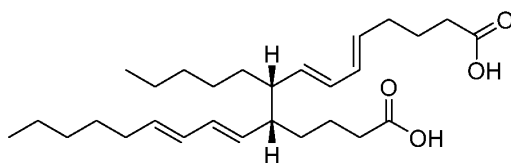
(formula IIIa);



(formula IIIb);



(formula IIIc); or



(formula IIId);

or any combination thereof;

or a salt, ester, prodrug, or labelled derivative thereof.

67. A compound or method as described herein.