Claims

What is claimed is:

1. A method of estimating de novo lipogenesis in a subject comprising:

measuring in vitro the levels of three or more biomarkers in a biological sample wherein the biomarkers are selected from the group consisting of the total level of myristic acid (14:0), the total level of myristoleic acid (14:1n5), the total level of palmitate (16:0), the total level of palmitoleate (16:1n7), the total level of sapienic acid (16:1n10), , the total level of squalene, , the total level of linoleate (18:2n6), the total level of arachidonic acid (20:4n6), the total level of docosaheaenoic acid (22:6n3), the level of myristic acid (14:0) in one or more lipid class, the level of myristoleic acid (14:1n5) in one or more lipid class, the level of palmitate (16:0) in one or more lipid class, the level of palmitoleate (16:1n7) in one or more lipid class, the level of sapienic acid (16:1n10) in one or more lipid class, the level of squalene in one or more lipid class, , the level of linoleate (18:2n6) in one or more lipid class, the level of arachidonic acid (20:4n6) in one or more lipid class, and the level of docosaheaenoic acid (22:6n3) in one or more lipid class in a sample collected from the subject; and

using one of the following models to generate a de novo lipogenesis index score to estimate the de novo lipogenesis in the subject:

(i) DNL= a(16:0) + b(16:1n7) - c(18:2n6)

(ii) DNL = (a(16:0) + b(16:1n7)) / c(18:2n6)

(iii) DNL = a(16:0) + b(16:1n7) - c(18:2n6) + d(14:0) + e(14:1n5)

(iv) DNL = a(16:0) + b(16:1n7) - c(18:2n6) + d(14:0) + e(14:1n5)-f(20:4n6) – g(22:6n3)

(v) DNL = a(16:0) + b(16:1n10) - c(18:2n6), or

(vi) DNL = a(16:0) + b(16:1n10) - c(squalene),

wherein a, b, c, d, e, f, g, are constant numbers; (16:0), (16:1n7), (18:2n6), (14:0), (14:1n5), (20:4n6), (22:6n3), (16:1n10) and squalene, are measured values of the biomarker analyte; and DNL is the predicted de novo lipogenesis index score.

2. The method of claim 1, wherein the biomarkers comprise the total levels of palmitate (16:0), palmitoleate (16:1n7) and linoleate (18:2n6) in blood.

3. The method of claim 2, wherein the biomarkers further comprise the total levels of myristic acid (14:0), and (14:1n5) in blood.

4. The method of claim 3, wherein the biomarkers further comprise the total levels of arachidonic acid (20:4n6) and docosaheaenoic acid (22:6n3) in blood.

5. The method of claim 1, wherein the biological sample is selected from the group consisting of a sebum sample, a skin sample, an epidermal sample, and a skin cell sample and wherein the three or more biomarkers are selected from the group consisting of 16:0, 16:1n7, 16:1n10, 14:0, 14:1n5, 18:2n6, 20:4n6, squalene, and 22:6n3 and combinations thereof.

6. The method of claim 1, wherein the biomarkers are measured in one or more individual lipid classes selected from the group consisting of triacylglycerides, phosphatidylcholine, and cholesteryl esters.

7. The method of claim 1, wherein the biomarkers are measured after separating the fatty acids from their backbone.

8. The method of claim 1, wherein the biomarkers are measured as an intact complex lipid species.

9. The method of claim 1, wherein the biomarkers are measured in total blood lipids.

10. The method of claim 1, wherein the de novo lipogenesis index score is used to assess the disease status of an individual having non-alcoholic steatohepatitis (NASH), non-alcoholic fatty liver disease (NAFLD), insulin resistance, or diabetes.

11. The method of claim 1, wherein the de novo lipogenesis index score is used to assess liver health of an individual having liver impairment in the form of non-alcoholic steatohepatitis (NASH), non-alcoholic fatty liver disease (NAFLD), insulin resistance, or diabetes.

12. The method of claim 1, wherein the de novo lipogenesis index score is used for staging hepatic disorders.

13. The method of claim 12, wherein the hepatic disorder is selected from the group consisting of non-alcoholic steatohepatitis (NASH) and non-alcoholic fatty liver disease (NAFLD).

14. The method of claim 1, wherein the de novo lipogenesis index score is used to predict a progression of weight gain from normal to obesity.

15. The method of claim 1, wherein the de novo lipogenesis index score is used to monitor the response to a therapeutic agent on de novo lipogenesis and associated disease conditions.

16. The method of claim 15, wherein the therapeutic agent is a small molecule inhibitor.

17. The method of claim 1, wherein the de novo lipogenesis index score is used to determine the efficacy of a therapeutic agent to inhibit de novo lipogenesis.

18. The method of claim 17, wherein the therapeutic agent is selected from the group consisting of acetyl-CoA carboxylase (ACC), fatty acid synthase (FAS), stearoyl-CoA desaturase (SCD), elongates (ELOVL), and diacylglycerol:CoA acyltransferase (DGAT) inhibitors.

19. The method of claim 1, wherein the de novo lipogenesis index score is a sebum de novo lipogenesis index score and is calculated by using model (v) or (vi)