CLAIMS

What is claimed:

1. Use of a GLP-1 agonist in the manufacture of a medicament for the treatment of obesity and/or one or more obesity-related co-morbidities in a mammal, wherein the mammal comprises the presence of a plurality of single nucleotide polymorphisms (SNPs) in a sample obtained from the mammal suffering from obesity, wherein the plurality of SNPs is selected from the group consisting of rs1664232, rs11118997, rs9342434, rs2335852, rs11020655, rs1885034, rs7277175, rs6923761, rs7903146, rs17782313, rs3813929, rs1047776 and any combination thereof.
2. The use of claim 1, wherein the sample is selected from the group consisting of a blood sample, a saliva sample, a urine sample, a breath sample, and a stool sample.
3. The use of claim 1, wherein the GLP-1 agonist is selected from the group consisting of exenatide, liraglutide and semaglutide.
4. The use of any one of claims 1-3, wherein the mammal possesses a delay in gastric emptying as compared to gastric emptying in a control.
5. A method for assaying a sample obtained from a mammal suffering from obesity and/or one or more obesity-related co-morbidities, the method comprising detecting the presence of a plurality of single nucleotide polymorphisms (SNPs) in a sample obtained from the mammal, wherein the plurality of SNPs are selected from the group consisting of rs1664232, rs11118997, rs9342434, rs2335852, rs11020655, rs1885034, rs7277175, rs6923761, rs7903146, rs17782313, rs3813929, rs1047776 and any combination thereof.
6. The method of claim 5, wherein the sample is selected from the group consisting of a blood sample, a saliva sample, a urine sample, a breath sample, and a stool sample.
7. A system for determining an obesity phenotype of a mammal suffering from obesity, the system comprising:

   (a) one or more processors;

   (b) one or more memories operatively coupled to at least one of the one or more processors and having instructions stored thereon that, when executed by at least one of the one or more processors, cause the system to

(i) identify the presence, absence or level of a plurality of gastrointestinal (GI) peptides, a plurality of metabolites, and/or a plurality of genetic variants in a sample obtained from a mammal suffering from obesity, thereby generating an analyte signature for the sample;

(ii) populate a predictive machine learning model with the analyte signature of step (i); and

(iii) utilize the predictive machine learning model to predict an obesity phenotype of the mammal suffering from obesity based on the analyte signature of the sample; and

(c) one or more instruments in communication with at least one of the one or more processors, wherein the instruments, upon receipt of instructions sent by the at least one of the one or more processors, perform steps (i)-(iii).

8. The system of claim 7, wherein the predictive machine learning model is selected from the group consisting of least absolute shrinkage and selection operator (LASSO) regression, a classification and regression tree (CART) model, and a gradient boosting machine (GBM) model.
9. The system of claim 7 or 8, wherein the obesity phenotype is selected from the group consisting of abnormal satiation (hungry brain), abnormal satiety (hungry gut); hedonic eating (emotional hunger) and slow metabolism (slow burn).
10. The system of claim 7, wherein utilization of the predictive machine learning model predicts the obesity phenotype of the mammal suffering from obesity with an accuracy of at least 75% 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99%.
11. The system of claim 7, wherein utilization of the predictive machine learning model predicts the obesity phenotype of the mammal suffering from obesity with a precision of at least 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75% 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99%.
12. The system of claim 7, wherein the sample is selected from the group consisting of a blood sample, a saliva sample, a urine sample, a breath sample, and a stool sample.

13. The system of claim 7, wherein the plurality of GI peptides is selected from the group consisting of ghrelin, peptide tyrosine tyrosine (PYY), cholecystokinin (CCK), glucagon-like peptide-1 (GLP-1), GLP-2, glucagon, oxyntomodulin, neurotensin, fibroblast growth factor (FGF), GIP, OXM, FGF19, FGF19, and pancreatic polypeptide.
14. The system of claim 7, wherein the plurality of metabolites is selected from the group consisting of a bile acid, a neurotransmitter, an amino compound and a fatty acid.
15. The system of claim 7, wherein the plurality of metabolites is selected from the group consisting of 1-methylhistine, serotonin, glutamine, gamma-amino-n-butyric-acid, isocaproic, allo-isoleucine, hydroxyproline, beta-aminoisobutyric-acid, alanine, hexanoic, tyrosine, phenylalanine .gamma.-aminobutyric acid, acetic, histidine, LCA, ghrelin, ADRA2A, cholesterol, glucose, acetylcholine, propionic, CDCA, PYY, ADRA2C, insulin, adenosine, isobutyric, 1-methylhistidine, DCA, CCK, GNB3, glucagon, aspartate, butyric, 3-methylhistidine, UDCA, GLP-1, FTO, leptin, dopamine, valeric, asparagine, HDCA, GLP-2, MC4R, adiponectin, D-serine, isovaleric, phosphoethanolamine, CA, glucagon, TCF7L2, glutamate, hexanoic, arginine, GLCA, oxyntomodulin, 5-HTTLPR, glycine, octanoic, carnosine, GCDCA, neurotensin, HTR2C, myristic, taurine, GDCA, FGF, UCP2, norepinephrine, palmitic, anserine, GUDCA, GIP, UCP3, serotonin, palmitoleic, serine, GHDCA, OXM, GPBAR1, taurine, palmitelaidic, glutamine, GCA, FGF19, NR1H4, stearic, ethanolamine, TLCA, FGF21, FGFR4, oleic, glycine, TCDCA, LDL, elaidic, aspartic acid, TDCA, insulin, GLP-1, linoleic, sarcosine, TUDCA, glucagon, CCK, a-linolenic, proline, THDCA, amylin, arachidonic, alpha-aminoadipic-acid, TCA, pancreatic polypeptide, eicosapentaenoic, DHCA, neurotensin, docosahexaenoic, alpha-amino-N-butyric-acid, THCA, ornithine, GLP-1 receptor, triglycerides, cystathionine 1, GOAT, cystine, DPP4, lysine, methionine, valine, isoleucine, leucine, homocystine, tryptophan, citrulline, glutamic acid, beta-alanine, threonine, hydroxylysine 1, acetone, and acetoacetic acid. In some cases, an obesity analyte signature can include 1-methylhistine, serotonin, glutamine, gamma-amino-n-butyric-acid, isocaproic, allo-isoleucine, hydroxyproline, beta-aminoisobutyric-acid, alanine, hexanoic, tyrosine, and phenylalanine.
16. The system of claim 7, wherein the plurality of genetic variants comprises single nucleotide polymorphisms (SNPs) in one or more genes selected from the group consisting of HTR2C, POMC, NPY, AGRP, MC4R, GNB3, SERT, BDNF, PYY, GLP-1, GPBAR1, TCF7L2,

ADRA2A, PCSK, TMEM18, SLC6A4, DRD2, UCP3, FTO, LEP, LEPR, UCP1, UCP2, ADRA2, KLF14, NPC1, LYPLAL1, ADRB2, ADRB3, GLP1R, PLXNA1, EYS, PTPRN2, PANX1, FRMD6, PCNT and BBS1.

17. The system of claim 7, wherein the plurality of genetic variants comprises two or more SNPs selected from the group consisting of rs1664232, rs11118997, rs9342434, rs2335852, rs11020655, rs1885034, rs7277175, rs6923761, rs7903146, rs1414334, rs4795541, rs1626521 and rs2075577.
18. The system of claim 7, wherein the one or more memories operatively coupled to the at least one of the one or more processors and having instructions stored thereon that, when executed by at least one of the one or more processors, further cause the system to populate the predictive learning model with data concerning the gastric motor function, resting energy expenditure (REE), one or more measures of appetite, results on behavioral questionnaires or any combination thereof of the subject suffering from obesity.
19. The system of claim 18, wherein the gastric motor function is determined by measuring gastric emptying of the mammal, the REE of the mammal is measured by indirect calorimetry, the behavioral questionnaire is a Hospital Anxiety and Depression Scale (HADS) questionnaire and/or the one or more measures of appetite are selected from the group consisting of calories to fullness (CTF), maximum tolerated calories (MTC) and intake calories at an *ad libitum* buffet meal.
20. The system of claim 19, wherein the gastric emptying is measured using scintigraphy.