CLAIMS

1. A method of determining healthy aging in an individual, the method comprising:

(a) determining the presence or an amount of at least one microorganism in a sample representing the individual's gut microbiome, wherein the at least one microorganism selected from Table 1A, wherein an enrichment of said microorganisms is indicative of healthy aging; and/or

(b) determining the presence or an amount of at least one microorganism in a sample representing the individual's gut microbiome, wherein the at least one microorganism selected from Table 1B, wherein a depletion of said microorganisms is indicative of healthy aging.

2. A method of determining total cholesterol levels in an individual, the method comprising determining the presence or an amount of microorganisms in a sample representing the individual's gut microbiome, wherein the microorganisms are *Lachnospiraceae bacterium 14 56FAA* and *Ruminococcus lactaris*, wherein an enrichment of said microorganisms is indicative of a higher than normal level of total cholesterol levels.

3. A method of determining inflammation associated with high-sensitivity C-reactive protein (HSCRP) in an individual, the method comprising determining the presence or an amount of microorganisms in a sample representing the individual's gut microbiome, wherein the microorganisms are *Lachnospiraceae bacterium 2 1 46FAA, Streptococcus infantarius, Streptococcus salivarius, Eggerthella unclassified and Escherichia coli*, wherein an enrichment of said microorganisms is indicative of inflammation.

4. A method of determining hepatic health in an individual, the method comprising determining the presence or an amount of *Klebsiella pneumoniae* in a sample representing the individual's gut microbiome, wherein an enrichment of said microorganism is indicative of hepatic disease.

5. A method of determining physical strength or weakness in a subject, the method comprising determining the presence or an amount of *Fusobacterium mortiferum* in a sample representing the individual's gut microbiome, wherein an enrichment of said microorganism is indicative of physical strength.

6. A method of determining physical strength or weakness in a subject, the method comprising determining the presence or an amount of *Dialister invisus* in a sample representing the individual's gut microbiome, wherein a depletion of said microorganism is indicative of weakness.

7. A method of determining if a subject has healthy levels of vitamin B12 , the method comprising determining the presence or an amount of *Streptococcus parasanguinis or Bacteroides coprocola* in a sample representing the individual's gut microbiome, wherein an enrichment of said microorganism is indicative of healthy levels of vitamin B12.

8. Use of a composition in the manufacture of a medicament for promoting healthy ageing, wherein the medicament is to be administered to a subject, and wherein the medicament improves intestinal flora by:

(a) enriching at least one microorganism selected from Table 1A , and/or

(b) reducing or suppressing at least one microorganism selected from Table 1B.

9. A pharmaceutical composition comprising an isolated microorganism for use in promoting healthy ageing in a subject, wherein the isolated microorganism is selected from Table 1A.

10. A composition or pharmaceutical composition for promoting healthy ageing, the composition comprising an agent for:

(a). enriching at least one microorganism selected from Table 1A*;* and/or

(b). reducing or suppressing at least one microorganism selected from Table 1B.

11. Use of a composition comprising at least one of or a combination of microorganisms selected from Table 1A in the manufacture of a medicament for promoting healthy ageing.

12. A method of determining the likelihood of healthy aging in an individual, the method comprising:

(a) determining a gut microbiome signature of the individual by determining an amount of, or presence or absence of, each microorganism in a group of microorganisms present in a sample obtained from the individual; and

(b) applying a prediction model to assess the gut microbiome signature with respect to a gut profile representative of an individual that is aging healthily,

wherein the prediction model is trained using a dataset of microbiome profiles of a plurality of individuals who are aging healthily and said gut profile comprises:

(i) an enrichment of at least one microorganism selected from Table 1A; and/or

(ii) a depletion of at least one microorganism selected from Table 1B.

13. The method according to claim 12, wherein the prediction model comprises a machine learning probability model.

14 A computer readable storage medium comprising computer readable instructions operable when executed by a computer to predict the likelihood of healthy aging in an individual, the computer readable instructions configured to perform a method according to any one of claims 12 or 13.

15. An apparatus or system comprising:

(a) a receiving unit configured to receive a dataset of values representing a gut microbiome signature of an individual by determining an amount of, or presence or absence of, each microorganism in a group of microorganisms present in a sample obtained from the individual; and

(b) a processor configured to process a prediction model to assess the gut microbiome signature with respect to a gut profile representative of good gut health to obtain a likelihood of healthy aging in the individual,

wherein the prediction model is trained using a dataset of microbiome profiles of a plurality of individuals who are aging healthily and said profile comprises:

(i) an enrichment of at least one microorganism selected from Table 1A; and/or

(ii) a depletion of at least one microorganism selected from Table 1B.