Claims

1. A method for determining the health of an individual from a sample extracted from that individual, comprising the steps of:

(i) testing the sample for the presence of biomarkers specific for health;

(ii) determining whether the subject is healthy, is of intermediate health, or is unhealthy, based on the detection of said biomarkers;

characterised in that the biomarkers are autoantibodies to antigens comprising AURKA, FEN1, GLRX3, PHLDA1, PPM1A, FKBP3, CD96 and MAPK13.

2. The method according to claim 1 wherein the antigens further comprise one or more of UBE2I, AAK1, YARS, ASPSCR1, CASP10, FHOD2, TCL1A and MAP4.

3. The method according to claim 1 or 2 wherein the antigens are exposed to a sample extracted from a person, such that autoantibody biomarkers from the sample may bind to the antigens.

4. The method according to claim 3 wherein the antigens are subsequently exposed to a fluorescently-tagged secondary antibody to allow the amount of any autoantibodies from the sample bound to the antigens to be determined.

5. The method according to claim 4 wherein the health status of the person corresponds to the relative or absolute amount of autoantibodies from the sample specifically binding to the antigens.

6. The method according to any preceding claim wherein the sample comprises any or any combination of exosomes, blood, serum, plasma, urine, saliva, amniotic fluid, cerebrospinal fluid, breast milk, semen or bile.

7. The method according to any preceding claim wherein the steps are performed *in vitro*.

8. The method according to any preceding claim wherein the method comprises detecting upregulation/downregulation of one or more biomarkers.

9. The method according to any preceding claim wherein PHLDA1 and CD96 correspond to healthy, AURKA, FEN1, CASP10 and AAK1 correspond to intermediate health, and UBE2I, YARS, ASPSCR1, FHOD2, TCL1A, MAP4, MAPK13, FKBP3, PPM1A and GLRX3 correspond to unhealthy.

10. The method according to any preceding claim wherein the individual is elderly.

11. The method according to any preceding claim wherein the antigens are biotinylated proteins.

12. The method according to claim 11 wherein each biotinylated protein is formed from a Biotin Carboxyl Carrier Protein folding marker which is fused in-frame with a protein.

13. The method according to claim 11 or 12 wherein the biotinylated proteins are bound to a streptavidin-coated substrate.

14. The method according to claim 13 wherein the substrate comprises a hydrogel-forming polymer base layer.

15. A method for manufacturing a kit for determining the health of an elderly individual from a sample extracted from that individual, comprising the steps of:

for each antigen in a panel, cloning a biotin carboxyl carrier protein folding marker in-frame with a gene encoding the said antigen and expressing the resulting biotinylated antigen;

binding the biotinylated antigens to addressable locations on one or more streptavidin-coated substrates, thereby forming an antigen array;

such that the amount of autoantibodies from the sample binding to the antigens on the panel can be determined by exposing the substrate to the sample and measuring the response;

characterised in that the antigens comprise UBE2I, AAK1, YARS, ASPSCR1, CASP10, FHOD2, TCL1A, MAP4, MAPK13, CD96, FKBP3, PPM1A, PHLDA1, GLRX3, FEN1 and AURKA.

16. A composition comprising a panel of antigens for determining the health of an elderly individual, characterised in that the antigens comprise MAPK13, CD96, FKBP3, PPM1A, PHLDA1, GLRX3, FEN1 and AURKA, and optionally comprising one or more of UBE2I, AAK1, YARS, ASPSCR1, CASP10, FHOD2, TCL1A, and MAP4.

17. A composition according to claim 16 wherein the antigens are biotinylated proteins.

18. A composition according to any of claims 16-17 wherein the amount of one or more autoantibody biomarkers binding *in vitro* to the antigens in a sample from a patient can be measured to determine the health status of the patient.

19. A composition comprising a panel of autoantibody biomarkers for determining the health status of an elderly patient:

wherein the level of one or more autoantibody biomarkers are measured in a sample from the patient;

characterised in that the one or more autoantibody biomarkers are selected from autoantibodies specific for one or more of the following antigens: MAPK13, CD96, FKBP3, PPM1A, PHLDA1, GLRX3, FEN1 and AURKA;

and optionally comprising one of more of the following antigens: UBE2I, AAK1, YARS, ASPSCR1, CASP10, FHOD2, TCL1A, and MAP4.

Claims

1. A method for determining the health of an elderly individual from a serum/plasma sample extracted from that individual, comprising the steps of:

(i) testing the sample for the presence of biomarkers specific for health;

(ii) determining whether the subject is healthy, is of intermediate health, or is unhealthy, based on the detection of the presence of said biomarkers;

characterised in that the biomarkers are autoantibodies to antigens comprising AURKA, FEN1, GLRX3, PHLDA1, PPM1A, FKBP3, CD96 and MAPK13; and

wherein healthy corresponds to detection of PHLDA1 and CD96 at a lower level compared to the levels for unhealthy/intermediate health, intermediate health corresponds to detection of AURKA, FEN1 at a lower level compared to the levels for healthy/unhealthy, and unhealthy corresponds to detection of MAPK13, FKBP3, PPM1A and GLRX3 at a higher level compared to the levels for healthy/intermediate health.

2. The method according to claim 1 wherein the antigens further comprise one or more of UBE2I, AAK1, YARS, ASPSCR1, CASP10, FHOD2, TCL1A and MAP4, wherein detection of CASP10 and AAK1 at a lower level compared to healthy/unhealthy corresponds to intermediate health, and detection of UBE2I, YARS, ASPSCR1, FHOD2, TCL1A, MAP4 at a higher level compared to healthy/intermediate health corresponds to unhealthy.

3. The method according to claim 1 or 2 wherein the antigens are exposed to a sample extracted from a person, such that autoantibody biomarkers from the sample may bind to the antigens.

4. The method according to claim 3 wherein the antigens are subsequently exposed to a fluorescently-tagged secondary antibody to allow the amount of any autoantibodies from the sample bound to the antigens to be determined.

5. The method according to claim 4 wherein the health status of the person corresponds to the relative or absolute amount of autoantibodies from the sample specifically binding to the antigens.

6. The method according to any preceding claim wherein the steps are performed *in vitro*.

7. The method according to any preceding claim wherein the method comprises detecting upregulation/downregulation of one or more biomarkers.

8. The method according to any preceding claim wherein the antigens are biotinylated proteins.

9. The method according to claim 8 wherein each biotinylated protein is formed from a Biotin Carboxyl Carrier Protein folding marker which is fused in-frame with a protein.

10. The method according to claim 8 or 9 wherein the biotinylated proteins are bound to a streptavidin-coated substrate.

11. The method according to claim 10 wherein the substrate comprises a hydrogel-forming polymer base layer.

12. A method for manufacturing a kit for determining the health of an elderly individual from a serum/plasma sample extracted from that individual, comprising the steps of:

for each antigen in a panel, cloning a biotin carboxyl carrier protein folding marker in-frame with a gene encoding the said antigen and expressing the resulting biotinylated antigen;

binding the biotinylated antigens to addressable locations on one or more streptavidin-coated substrates, thereby forming an antigen array;

such that the amount of autoantibodies from the sample binding to the antigens on the panel can be determined by exposing the substrate to the sample and measuring the response;

characterised in that the antigens comprise UBE2I, AAK1, YARS, ASPSCR1, CASP10, FHOD2, TCL1A, MAP4, MAPK13, CD96, FKBP3, PPM1A, PHLDA1, GLRX3, FEN1 and AURKA.

13. A composition comprising a panel of antigens for determining the health of an elderly individual, characterised in that the antigens comprise MAPK13, CD96,

FKBP3, PPM1A, PHLDA1, GLRX3, FEN1 and AURKA, and optionally comprising one or more of UBE2I, AAK1, YARS, ASPSCR1, CASP10, FHOD2, TCL1A, and MAP4.

14. A composition according to claim 13 wherein the antigens are biotinylated proteins.

15. A composition according to any of claims 13-14 wherein the amount of one or more autoantibody biomarkers binding *in vitro* to the antigens in a serum/plasma sample from a patient can be measured to determine the health status of the patient.

16. A composition comprising a panel of autoantibody biomarkers for determining the health status of an elderly patient:

wherein the level of autoantibody biomarkers are measured in a serum/plasma sample from the patient;

characterised in that the autoantibody biomarkers comprise autoantibodies specific for at least the following antigens: MAPK13, CD96, FKBP3, PPM1A, PHLDA1, GLRX3, FEN1 and AURKA;

and optionally comprising one of more of the following antigens: UBE2I, AAK1, YARS, ASPSCR1, CASP10, FHOD2, TCL1A, and MAP4.