CLAIMS

1. A method of patterned data analysis for evaluating individual metabolic response and for generating predictive clinical metrics for disorders of glucose metabolism, such as prediabetes and diabetes on HATR-FTIR spectrometer, comprising of:

(i) assigning glucose-specific peaks with characteristic absorption wave numbers at 1030 cm^{-1},1041 cm^{-1}, 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1} in the mid-IR spectra of a subject under postprandial glucose test or OGTT (Oral Glucose Tolerance Test) at the different doses of 5 g, 20 g and/or 75 g, wherein assigned peaks within 1030 cm^{-1} and 1041 cm^{-1} are always bounded bands in the 700-4000 cm^{-1} region by HATR-FTIR (Horizontal attenuated total reflection Fourier transform infrared) spectroscopy;

(ii) determining characteristic spectral parameters for each assigned glucose-specific peak in correlation with its position and shift in the mid-IR spectra, wherein characteristic predominant peak position with its shift within 1030 cm^{-1} or 1041 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1}, to be specific for healthy, prediabetic and diabetic subjects;

(iii) further determining characteristic spectral parameters for each assigned glucose-specific peak in correlation with its level in the mid-IR spectra under a continuous 120-minute monitoring at pre-determined time-intervals from the starting till the ending time-points of the test, wherein characteristic determination of the peak with the highest level at 1030 or 1041 cm^{-1} within 1030-1041 cm^{-1}, determination of the peak with the highest level among all assigned glucose-specific peaks, to be specific for healthy, prediabetic and diabetic subjects;

(iv) further determining characteristic spectral parameters for each assigned glucose-specific peak level dynamic changes in dose-response correlation to oral glucose *per os* between low, medium and high doses under a continuous 120-minute monitoring at pre-determined time-intervals from the starting till the ending time-points of OGTT test with 5 g (low), 20 g (medium) and/or 75 g (high) glucose, wherein characteristic dose-indifferentiated dynamical changes of the level of the peaks within 1030-1041 cm^{-1}, 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1} to be specific for healthy subjects, characteristic dose-differentiated dynamical changes of the level of the peaks within 1030-1041 cm^{-1}, 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1} to be specific for prediabetic and diabetic subjects;

(v) calculation of the LT (latency time) for each assigned glucose-specific peak identified in

step (i), in comparison with calculated LT for CBG (capillary blood glucose) measurements in the same subject, for calculation of their LTs differences, wherein single, bi-phase or cascadic LT's appearance, to be specific for healthy, prediabetic and diabetic subjects;

(vi) determining the spectral characteristics of the LT differences for each assigned glucose-specific peak in dose-response correlation to oral glucose *per os* between low, medium and high doses under a continuous 120-minute monitoring at pre-determined time-intervals from the starting till the ending time-points of OGTT test with 5 g (low), 20 g (medium) and/or 75 g (high) glucose, wherein the time duration of the LT differences to be specific for healthy, prediabetic and diabetic subjects; and

(vii) determining the spectral pattern of individual metabolic response, based on spectral qualitative and quantitative parametric evaluation of GV (glycemic variability) with its dynamics identified in steps (ii)-(iv), the LT calculation with its difference with the LT in CBG identified in steps (v-vi), to be specific for healthy, prediabetic or diabetic subjects,
wherein

the spectral pattern with predominant left-shifted mean peak position towards 1030 cm-1 at 1030 - 1041 cm^{-1} according to Figure 8 c-e and Figure 11 a, predominant left-shifted mean peak position towards 1116-1118 cm^{-1} at 1118 cm^{-1} according to Figure 5 c and Figure 7 a, predominant left-shifted mean peak position towards 1149-1153 cm^{-1} at 1153 cm^{-1} according to Figure 8 e and Figure 11 d, highest glucose peak levels at 1030-1041 cm^{-1} over for peaks levels at 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1} according to Figure 8 c-e, lowest glucose peak levels at 1153 cm^{-1} below peaks levels at 1030-1041 cm^{-1}, 1080 cm^{-1} and 1118 cm^{-1} according to Figure 8 e, independent to intaken glucose dose peak levels at 1030-1041 cm^{-1}, 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1} under OGTT at 5 g (low), 20 g (medium) and 75 g (high) according to Figure 5 a-c,

bi-phase LTs and LT's differences at 1030-1041 cm^{-1} of 15` and 30` under OGTT at 5 g according to Table 2 (column 3, row 2),

single-phase LTs and LT's differences at 1030-1041 cm^{-1} of 10` under OGTT at 20 g according to Table 2 (column 4, row 2),

bi-phase LTs and LT's differences at 1030-1041 cm^{-1} of 5`and 30`under OGTT at 75 g according to Table 2 (column 5, row 2),

bi-phase LTs and LT's differences at 1080 cm^{-1} of 15` and 30` under OGTT at 5 g according to Table 2 (column 3, row 3),

cascading multi-phase LTs and LT's differences at 1080 cm^{-1} of 0`, 10`and 20` under OGTT at 20 g according to Table 2 (column 4, row 3),

single-phase LTs and LT's differences at 1080 cm^{-1} of 5` under OGTT at 75 g according to Table 2 (column 5, row 3),

bi-phase LTs and LT's differences at 1118 cm^{-1} of 10` and 25` under OGTT at 5 g according to Table 2 (column 3, row 4),

single-phase LT and LT's difference at 1118 cm^{-1} of 10` under OGTT at 20 g according to Table 2 (column 4, row 4),

bi-phase LTs and LT's differences at 1118 cm^{-1} of 5` and 25` under OGTT at 75 g according to Table 2 (column 5, row 4),

bi-phase LTs and LT's differences at 1153 cm^{-1} of 35` and 50` under OGTT at 5 g according to Table 2 (column 3, row 5),

single-phase LT and LT's difference at 1153 cm^{-1} of 10`and 15` under OGTT at 20 g according to Table 2 (column 4, row 5),

single-phase LT and LT's difference at 1153 cm^{-1} of 30` under OGTT at 75 g according to Table 3 (column 5, row 5),

the longest durations of LT's differences of

5`& 30` (75 g), 10` (20 g) and 15`& 30` (5 g) at 1030-1041 cm^{-1},

5` (75 g), 0`& 10`& 20` (20 g) and 15`& 30` (5 g) at 1080 cm^{-1},

5`& 25` (75 g), 10` (20 g) and 10`& 25` (5 g) at 1118 cm^{-1},

10` (75 g), 10` & 15` (20 g) and 35`and 50` at 1153 cm^{-1}

under OGTT with different doses according to Table 2,

dose-independent LTs and LT's differences for each assigned glucose-specific peak under any OGTT with different doses of 5 g, 20 g or 75 g,

bi-phase LTs with LT's differences of 15` & 30` at 1030-1041 cm^{-1}, 15` & 30` at 1080 cm^{-1}, 10` & 25` at 1118 cm^{-1}, 35` & 50` at 1153 cm^{-1} under OGTT at 5 g according to Table 2 (column 3),

single-, bi-phase and cascading multi-phase LTs with LT's differences of 10` at 1030-1041 $cm^{-1}$, 0` & 10` and 20` at 1080 cm^{-1}, 10`at 1118 $cm^{-1}$, 10` & 15`at 1153 cm^{-1} under OGTT at 20 g according to Table 2 (column 4),

single- and bi-phase LTs with LT's differences of 5`& 30`at 1030-1041 cm^{-1}, 5` at 1080 $cm^{-1}$, 5`& 25`at 1118 $cm^{-1}$, 10` at 1153 cm^{-1} under OGTT at 75 g according to Table 2 (column 5),

the longest durations of LT's differences starting from 5` with single-, bi- or cascading

multi-phase appearances at 1030-1041 cm^{-1}, 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1} under OGTT at 75 g in a healthy subject according to Table 2 (column 5), Table 4 (column 2) or Table 7 (column 2), as compared with the shortest durations of LT's differences starting from 0` with single-phase appearances at 1030-1041 cm^{-1}, 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1} under OGTT at 75 g in a diabetic subject according to Table 3 (column 5), Table 4 (column 3) and Table 7 (column 4), and as compared with the shortest durations of LT's differences starting from 0` with cascading multi-phase appearances at 1030-1041 cm^{-1}, 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1} under OGTT at 75 g in a prediabetic subject according to Table 7 (column 3),

to be specific for a healthy subject, or

the spectral pattern with predominant right-shifted mean peak position towards 1037-1041 cm^{-1} at 1030 - 1041 cm^{-1} according to Figure 8 f and Figure 11 a, predominant right-shifted mean peak position towards 1120-1122 cm^{-1} at 1118 cm^{-1} according to Figure 11 c, similarly high peak levels at 1030-1041 cm^{-1} and at 1118 cm^{-1} over for peak levels at 1080 cm^{-1} and 1153 cm^{-1} according to Figure 8 f, lowest glucose peak levels at 1153 cm^{-1} below peaks levels at 1030-1041 cm^{-1}, 1080 cm^{-1} and 1118 cm^{-1} according to Figure 11 d, dependent to intaken glucose dose peak levels at 1030-1041 cm^{-1}, 1080 cm^{-1} and 1118 cm^{-1} under OGTT at 5 g (low), 20 g (medium) and 75 g (high) according to Figure 11 a-c,

cascading multi-phase LTs and LT's differences at 1030-1041 cm^{-1} of 5`, 20`, 30`& 45` under OGTT at 75 g according to Table 7 (column 3, row 2),

cascading multi-phase LTs and LT's differences at 1080 cm^{-1} of 5`, 20`& 45`under OGTT at 75 g according to Table 7 (column 3, row 3),

cascading multi-phase LTs and LT's differences at 1118 cm^{-1} of 5`, 20`, 30`& 40` under OGTT at 75 g according to Table 7 (column 3, row 4),

cascading multi-phase LTs and LT's differences at 1153 cm^{-1} of 0`, 15`, 25`& 55` under OGTT at 75 g according to Table 7 (column 3, row 5),

cascading multi-phase LTs and LT's differences of 5`- 45` at 1030-1041 cm^{-1}, 5`- 45` at 1080 cm^{-1}, 5`- 40` at 1118 cm^{-1}, 0`- 55` at 1153 cm^{-1} under OGTT at 75 g,

dose-independent LTs and LT's differences with cascading multi-phase appearances at

5`, 20`, 30` & 45` at 1030-1041 cm^{-1},

5`, 20` & 45` at 1080 cm^{-1},

5`, 20`, 30` & 40` at 1118 cm^{-1},

0`, 15`, 25` & 55` at 1153 cm^{-1}

under OGTT at 75 g according to Table 7 (column 3, rows 2-5),

the shortest durations of LT's differences starting from 0` with cascading multi-phase appearances at 1030-1041 $cm^{-1}$, 1080 $cm^{-1}$, 1118 $cm^{-1}$ and 1153 $cm^{-1}$ under OGTT at 75 g according to Table 7 (column 3), as compared with the shortest durations of LT's differences starting from 0` with single-phase appearances at 1030-1041 cm^{-1}, 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1} under OGTT at 75 g in a diabetic subject according to Table 3 (column 5), Table 4 (column 3) and Table 7 (column 4), and as compared with the longest durations of LT's differences starting from 5` with single-, bi- or cascading multi-phase appearances at 1030 1041 cm^{-1}, 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1} under OGTT at 75 g in a healthy subject according to Table 2 (column 5), Table 4 (column 2) or Table 7 (column 2),

to be specific for a prediabetic subject, or

the spectral pattern with dominant right-shifted mean peak position towards 1041 cm^{-1} at 1030 - 1041 cm^{-1} according to Figure 6 a, 8 a-b and 11 a, dominant right-shifted mean peak position towards 1120-1122 cm^{-1} at 1118 cm^{-1} according to Figure 6 c, dominant right-shifted mean peak position towards 1153-1157 cm^{-1} at 1153 cm^{-1} according to Figure 8 b, highest glucose peak levels at 1118 cm^{-1} over for peak levels at 1030-1041 cm^{-1}, 1080 cm^{-1} and 1153 cm^{-1} according to Figure 8 b, lowest glucose peak levels at 1153 cm^{-1} below peaks levels at 1030-1041 cm^{-1}, 1080 cm^{-1} and 1118 cm^{-1} according to Figure 8 b, dependent to intaken glucose dose peak levels at 1030-1041 cm^{-1}, 1080 cm^{-1} and 1118 cm^{-1} under OGTT at 5 g (low), 20 g (medium) and 75 g (high) according to Figure 6 a-c,

bi-phase LTs and LT's differences of 0` & 10` at 1030-1041 cm^{-1} under OGTT at 5 g according to Table 3 (column 3, row 2),

single-phase LT and LT's difference of 0` at 1030-1041 cm^{-1} under OGTT at 20 g according to Table 3 (column 4, row 2),

single-phase LT and LT's difference of 0` at 1030-1041 cm^{-1} under OGTT at 75 g according to Table 3 (column 5, row 2),

single-phase LT and LT's difference of 10` at 1080 cm^{-1} under OGTT at 5 g according to Table 3 (column 3, row 3),

single-phase LT and LT's difference of 15`at 1080 cm^{-1} under OGTT at 20 g according to Table 3 (column 4, row 3),

single-phase LT and LT's difference of 0`at 1080 cm^{-1} under OGTT at 75 g according to Table 3 (column 5, row 3) and to Table 7 (column 4, row 3),

cascading multi-phase LTs and LT's differences of 0`, 10` & 25` at 1118 cm^{-1} under OGTT at 5 g according to Table 3 (column 3, row 4),

single-phase LT and LT's difference of 5` at 1118 cm^{-1} under OGTT at 20 g according to Table 3 (column 4, row 4),

single-phase LT and LT's difference of 0` at 1118 cm^{-1} under OGTT at 75 g according to Table 3 (column 5, row 4),

bi-phase LTs and LT's differences of 15`& 25` under OGTT at 5 g according to Table 3 (column 3, row 5),

bi-phase LTs and LT's differences of 25`& 40` under OGTT at 20 g according to Table 3 (column 4, row 5),

single-phase LT and LT's differences of 30` under OGTT at 75 g according to Table 3 (column 5, row 5),

the shortest durations of LT's differences of

0` (75 g), 0` (20 g), 0` & 10` (5 g) at 1030-1041 cm^{-1},

0` (75 g), 15` (20 g), 10` (5 g) at 1080 cm^{-1},

0` (75 g), 5` (20 g), 0`& 10`& 25` (5 g) at 1118 cm^{-1},

30` (75 g), 25` & 40` (20 g), 15`& 25` at 1153 cm^{-1}

under OGTT with different doses according to Table 3,

the shortest durations of LTs and LT's differences of

0` at 1030-1041 cm^{-1},

0`, 0`& 60`or 60` at 1080 cm^{-1},

0`or 0`& 60` at 1118 cm^{-1},

30`& 60` at 1153 cm^{-1}

under post-prandial glucose test according to Table 1,

dose-dependent LTs and LT's differences at 1030-1041 cm^{-1}, 1080 cm^{-1} and 1118 cm^{-1} under any OGTT with different doses at 5 g, 20 g and 75 g glucose,

single-, bi-phase and cascading multi-phase LTs and LT's differences of 0` & 10` at 1030-1041 cm^{-1}, 10' at 1080 cm^{-1}, 0`, 10` & 25` at 1118 $cm^{-1}$, 15` & 25` at 1153 cm^{-1} under OGTT at 5 g according to Table 3 (column 3),

single- and bi-phase LTs and LT's differences of 0` at 1030-1041 cm^{-1}, 15' at 1080 cm^{-1}, 5' at 1118 cm^{-1}, 15'& 40' at 1153 cm^{-1} under OGTT at 20 g according to Table 3 (column 4),

single-phase LT and and LT's differences of 0' at 1030-1041 cm^{-1}, 0' at 1080 cm^{-1}, 0' at

1118 cm^{-1}, 30' at 1153 cm^{-1} under OGTT at 75 g according to Table 3 (column 5),

the shortest durations of LT's differences starting from 0` with single-phase appearances at 1030-1041 $cm^{-1}$, 1080 $cm^{-1}$, 1118 $cm^{-1}$ and 1153 $cm^{-1}$ under OGTT at 75 g according to Table 3 (column 5), Table 4 (column 3) and Table 7 (column 4), as compared with the shortest durations of LT's differences starting from 0` with cascading multi-phase appearances at 1030- 1041 cm^{-1}, 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1} under OGTT at 75 g in a prediabetic subject according to Table 7 (column 3), and as compared with the longest durations of LT's differences starting from 5` with single-, bi- or cascading multi-phase appearances at 1030-1041 cm^{-1}, 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1} under OGTT at 75 g in a healthy subject according to Table 2 (column 5), Table 4 (column 2) or Table 7 (column 2),

to be specific for a diabetic subject with type 2.

2. A method of monitoring the spectral pattern of individual metabolic response in the interstitial fluid of the epidermal skin tissue by HATR-FTIR spectroscopy based on spectral qualitative and quantitative parametric evaluation of GV with its dynamics and the LT calculation with its difference with the LT in CBG under a continuous 120-minute monitoring at pre-determined time-intervals from the starting till the ending time-points of post-prandial glucose test and/or OGTT at the different doses of 5 g, 20 g and/or 75 g for diagnosing prediabetes and diabetes type 2 in a subject, or for screening prediabetes and diabetes type 2 in a subject, or for predicting the risk of hyperglycemia in a subject, or for staging diabetes type 2 in a subject, or for monitoring diabetes control in a subject, said method is comprising of the steps (i)-(vii) in Claim 1.

3. Use of HATR-FTIR spectrometer for diagnosing disorders of glucose metabolism such as prediabetes and diabetes in a subject, or for screening and following-up disorders of glucose metabolism such as prediabetes and diabetes in a subject, or for predicting the risk of hyperglycemia in a subject, or for managing hyperglycemia in a subject, or for staging type 2 diabetes in a subject, or for assessing the quality of metabolic control in a subject, or for managing disorders of glucose metabolism such as prediabetes and diabetes in a subject, or for treating disorders of glucose metabolism such as prediabetes and diabetes in a subject.

4. The method of Claims 1-2, wherein the LT in the interstitial fluid of epidermal skin tissue is the time interval from the time-point of induction of glucose excursions till the time-point of maximum detected levels of said glucose-specific peaks by HATRFTIR spectroscopy under a continuous 120-minute monitoring at pre-determined time-intervals from the starting till the ending time-points of post-prandial glucose test and/or OGTT at the different doses of 5 g, 20 g

and/or 75 g in a subject.

5. The method of Claims 1-2, wherein the LT in CBG is the time interval from the time-point of induction of glucose excursions in capillary blood till the time-point of maximum detected levels of CBG by a portable glucosemeter under a continuous 120-minute monitoring at pre-determined time-intervals from the starting till the ending time-points of postprandial glucose test and/or OGTT at the different doses of 5 g, 20 g and/or 75 g in a subject.

6. The method of Claims 1-2, wherein induction of glucose excursions in the blood glucose is influenced by consumption of meal, or pure glucose *per os* at the different doses of 5 g, 20 g and/or 75 g in a subject.

7. The method of Claims 1-2, wherein a calibration prior a collection of mid-IR spectra by HATR-FTIR spectroscopy is performed on a subject by using CBG values pre-prandially and/or before the OGTT, used as referenced CBG values before any postprandial glucose test or the OGTT at the different doses of 5 g, 20 g and/or 75 g in the same subject.

8. The method of Claims 1-2, wherein collection of mid-IR spectra by HATR-FTIR spectroscopy is performed from the skin surface of the inner wrist in a subject.

9. Use of a glucose molecule with characteristic spectral parameters at absorption wave number at 1030 cm^{-1} or 1041 cm^{-1}, characterized by spectral bounded bands of glucose in the mid-IR spectra corresponding to identity and secondary structures to glucose molecules in correlation with characteristic measurements of the peak position and its shift, the peak levels on HATR-FTIR spectrometer in the interstitial fluid of the epidermal skin tissue of a healthy, prediabetic or diabetic subject under postprandial glucose test and/or OGTT with different doses of 5 g, 20 g and/or 75 g, for evaluating individual metabolic response and for generating predictive clinical metrics needed for diagnosing disorders of glucose metabolism such as prediabetes and diabetes, or for screening and follow-up of disorders of glucose metabolism such as prediabetes and diabetes, wherein the glucose molecule is selected from:

(i) a glucose molecule with

characteristic predominant mean peak position at 1030 cm^{-1} within 1030-1041 cm^{-1},

characteristic the highest glucose peak levels within 1030-1041 cm^{-1} against the other glucose peaks levels at 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1},

characteristic indifferentiated peak levels to low, medium and high glucose dose under OGTT with 5 g, 20 g and/or 75 g,

characteristic bi-phase LTs and the LTs differences with the time intervals of 15` and 30` under OGTT at 5 g,

characteristic single-phase LTs and the LTs differences with the time intervals of 10` under OGTT at 20 g,

characteristic bi-phase LTs and the LTs differences with the time intervals of 5`and 30`under OGTT at 75 g,

to be specific for a healthy subject; or

(ii) a glucose molecule with

characteristic predominant mean peak position at 1037-1041 cm^{-1} within 1030 - 1041 cm^{-1},

characteristic the highest glucose peak levels within 1030 - 1041 cm^{-1} similar to the peak levels at about 1118 cm^{-1},

characteristic dose-differentiated peak levels to high dose of glucose at 75 g under OGTT at 75 g,

characteristic multi-phase LTs and the LTs differences with the time intervals of 5`, 20`, 30`and 45`under OGTT at75 g,

to be specific for a prediabetic subject; or

(iii) a glucose molecule with

characteristic predominant mean peak position at 1039-1041 cm^{-1} within 1030 - 1041 cm^{-1},

characteristic differentiated to low, medium and high glucose dose peak levels under OGTT with 5 g, 20 g or 75 g,

characteristic single-phase LTs and the LTs differences with the time interval of 0`under post-

prandial glucose test,

characteristic bi-phase LTs and the LTs differences with the time intervals of 0`and 10` under

OGTT at 5 g,

characteristic single-phase LTs and the LTs differences with CBG with the time interval of 0`

under OGTT at 20 g,

characteristic single-phase LTs and the LTs differences with CBG with the time interval of 0`

under OGTT at 75 g,

to be specific for a diabetic subject.

to be specific for a diabetic subject.

10. Use of a glucose molecule with characteristic spectral parameters at absorption wave number at 1080 cm^{-1}, characterized by spectral band of glucose in the mid-IR spectra corresponding to identity and structures to glucose molecules in correlation with characteristic measurements of the peak position and its shift, the peak levels on HATR-FTIR spectrometer in the interstitial fluid of the epidermal skin tissue of a healthy, prediabetic or diabetic subject under post-prandial glucose test or OGTT with different doses at 5 g, 20 g or 75 g, for evaluating individual metabolic response and for generating predictive clinical metrics needed for diagnosing disorders of glucose metabolism, such as prediabetes and diabetes, or for screening and follow-up of disorders of glucose metabolism, such as prediabetes and diabetes, wherein the glucose molecule is selected from:

(i) a glucose molecule with

characteristic indifferentiated peak levels to low, medium and high glucose doses under OGTT with 5 g, 20 g or 75 g,

characteristic bi-phase LTs and the LTs differences with the time intervals of 15`and 30` under OGTT at 5 g,

characteristic three-phase LTs and the LTs differences with the time intervals of 0`, 10`and 20` under OGTT at 20 g,

characteristic single-phase LTs and the LTs differences with CBG with the time interval of 5` under OGTT at 75 g,

to be specific for a healthy subject; or

(ii) a glucose molecule with

characteristic differentiated peak levels to high glucose dose under OGTT with 75 g,

characteristic three-phase LTs and the LTs differences with the time intervals of 5`, 20`and 45`under OGTT at 75 g,

to be specific for a prediabetic subject; or

(iii) a glucose molecule with

characteristic dose-differentiated peak levels to low, medium and high glucose dose under OGTT with 5 g, 20 g or 75 g,

characteristic single-phase LTs and the LTs differences with the time interval of 10` under OGTT at 5 g,

characteristic single-phase LTs and the LTs differences with CBG with the time interval of 15`under OGTT at 20 g,

characteristic single-phase LTs and the LTs differences with the time interval of 0`under OGTT at 75 g,

to be specific for a diabetic subject.

11. Use of a glucose molecule with characteristic spectral parameters at absorption wave number at 1118 cm^{-1}, characterized by spectral band of glucose in the midIR spectra corresponding to identity and structures to glucose molecules in correlation with characteristic measurements of the peak position and its shift, the peak levels on HATR-FTIR spectrometer in the interstitial fluid of the epidermal skin tissue of a healthy, prediabetic or diabetic subject under post-prandial glucose test or OGTT with different doses at 5 g, 20 g and 75 g, for evaluating individual metabolic response and for generating predictive clinical metrics needed for diagnosing disorders of glucose metabolism, such as prediabetes and diabetes, or for screening and follow-up of disorders of glucose metabolism, such as prediabetes and diabetes, wherein the glucose molecule is selected from:

(i) a glucose molecule with

characteristic predominant left-shifted mean peak position within 1114-1118 cm^{-1}, wherein mean peak position at 1118 cm^{-1} is characteristic under OGTT at 5 g, mean peak position at 1114-1118 cm^{-1} is characteristic under OGTT at 20 g, mean peak position at 1116-1118 cm^{-1} is characteristic under OGTT at 75 g,

characteristic indifferentiated peak levels to low, medium and high glucose dose under OGTT with 5 g, 20 g and 75 g,

characteristic bi-phase LTs and the LTs differences with the time intervals of 10` and 25` under OGTT at 5 g,

characteristic single-phase LTs and the LTs differences with CBG with the time intervals of 10` under OGTT at 20 g,

characteristic bi-phase LTs and the LTs differences with CBG with the time intervals of 5`and 25`under OGTT at 75 g,

to be specific for a healthy subject; or

(ii) a glucose molecule with

characteristic predominant right-shifted mean peak position within 1120-1122 cm^{-1}, characteristic the highest glucose peak levels similar to glucose peak levels at 1030 – 1041 cm^{-1} over the other 2 glucose peak levels at 1080 cm^{-1} and 1153 cm^{-1},

characteristic dose-differentiated peak levels to high dose of glucose at 75 g under OGTT at 75 g,

characteristic cascading multi-phase LTs and the LTs differences with the time intervals of 5`, 20`, 30` and 40`under OGTT at 75 g,

to be specific for a prediabetic subject; or

(iii) a glucose molecule with

characteristic dominant right-shifted mean peak position at 1120-1122 cm^{-1},

characteristic the highest glucose peak levels within 1120-1122 cm^{-1} over glucose peaks levels at 1030-1041 cm^{-1}, 1080 cm^{-1} and 1153 cm^{-1},

characteristic dose-differentiated peak levels to low, medium and high doses of glucose at 5 g, 20 g and 75 g under OGTT at 5 g, 20 g and 75 g,

characteristic three-phase LTs and the LTs differences with the time intervals of 0`, 10` and 25`under OGTT at 5 g,

characteristic single-phase LTs and the LTs differences with the time interval of 5` under OGTT at 20 g,

characteristic single-phase LTs and the LTs differences with the time interval of 0` under OGTT at 75 g,

to be specific for a diabetic subject.

12. Use of a glucose molecule with characteristic spectral parameters at absorption wave number at 1153 cm^{-1}, characterized by spectral band of glucose in the midIR spectra corresponding to identity and structures to glucose molecules in correlation with characteristic measurements of the peak position and its shift, the peak levels on HATR-FTIR spectrometer in the interstitial fluid of the epidermal skin tissue of a healthy, prediabetic or diabetic subject under post-prandial glucose test or OGTT with different doses at 5 g, 20 g and 75 g, for evaluating individual metabolic response and for generating predictive clinical metrics needed for diagnosing disorders of glucose metabolism such as prediabetes and diabetes, or for screening and follow-up of disorders of glucose metabolism such as prediabetes and diabetes, wherein the glucose molecule is selected from:

(i) a glucose molecule with

characteristic predominant left-shifted mean peak position within 1149-1153 cm^{-1}, characteristic

the lowest glucose peak levels within 1153 cm^{-1} below glucose peaks levels at 1030-1041 cm^{-1}, 1080 cm^{-1} and 1118 cm^{-1},
characteristic bi-phase LTs and the LTs differences with CBG with the time intervals of 35` and 50` under OGTT at 5 g,
characteristic single-phase LTs and the LTs differences with the time intervals of 10` and 15` under OGTT at 20 g,
characteristic single-phase LTs and the LTs differences with the time interval of 10` under OGTT at 75 g,

to be specific for a healthy subject; or

(ii) a glucose molecule with
characteristic the lowest glucose peak levels within 1153 cm^{-1} below glucose peak levels at 1030-1041 cm^{-1}, 1080 cm^{-1} and 1118 cm^{-1},
characteristic cascading multi-phase LTs and the LTs differences with the time intervals of 0`, 15`, 25`and 55` under OGTT at 75 g,

to be specific for a prediabetic subject; or

(iii) a glucose molecule with
characteristic predominant right-shifted mean peak position within 1153-1157 cm^{-1},
characteristic the lowest glucose peak levels within 1153 cm^{-1} below glucose peak levels at 1030-1041 cm^{-1}, 1080 cm^{-1} and 1118 cm^{-1},
characteristic bi-phase LTs and the LTs differences with the time intervals of 15`and 25` under OGTT at 5 g,
characteristic bi-phase LTs and the LTs differences with the time intervals of 25`and 40` under OGTT at 20 g,
characteristic bi-phase LTs and the LTs differences with CBG with the time intervals of 30` under OGTT at 75 g,

to be specific for a diabetic subject.

13. Use of a combination group of glucose molecules with characteristic spectral parameters at absorption wave number at 1030 cm^{-1}, 1041 cm^{-1}, 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1}, characterized by spectral bands of glucose in the mid-IR spectra corresponding to identity and structures to glucose molecules in correlation with characteristic measurements of the peaks position and their shift, the peaks levels on HATR-FTIR spectrometer in the interstitial fluid of the epidermal skin tissue of a healthy, prediabetic or diabetic subject under post-prandial glucose test

or OGTT with different doses at 5 g, 20 g and 75 g, for evaluating individual metabolic response and for generating predictive clinical metrics needed for diagnosing disorders of glucose metabolism, such as prediabetes and diabetes, or for screening and follow-up of disorders of glucose metabolism, such as prediabetes and diabetes, wherein the combination group of glucose molecules is selected from:

(i) a combination group of glucose molecules with

characteristic the highest peak levels at 1030-1041 cm^{-1} over for glucose-specific peak levels at 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1},

characteristic the lowest glucose peak levels within 1153 cm^{-1} below the other glucose peaks levels at 1030-1041 cm^{-1}, 1080 cm^{-1} and 1118 cm^{-1},

indifferentiated to dose-response peak levels at 1030-1041 cm^{-1}, 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1},

characteristic bi-phase LT's differences with 15' and 30' at 1030-1041 cm^{-1}, 15' and 30' at 1080 cm^{-1}, 10' and 25' at 1118 cm^{-1}, 35' and 50' at 1153 cm^{-1} under OGTT at 5 g,

characteristic single-, bi- and three-phase LT's differences with 10' at 1030-1041 cm^{-1}, with 0', 10' and 20' at 1080 cm^{-1}, 10' at 1118 cm^{-1}, 10' and 15' at 1153 cm^{-1} under OGTT at 20 g, characteristic single- and bi-phase LT's differences with 5' and 30' at 1030-1041 cm^{-1},

5' at 1080 cm^{-1}, 5' and 25' at 1118 cm^{-1}, 10' at 1153 cm^{-1} under OGTT at 75 g,

to be specific for a healthy subject; or

(ii) a combination group of glucose molecules with

characteristic multi-phasic LT's differences with 5', 20', 30' and 45' at 1030-1041 cm^{-1},
with 5', 20' and 45' at 1080 cm^{-1}, with 5', 20', 30' and 40' at 1118 cm^{-1},
and with 0', 15', 25' and 55' at 1153 cm^{-1} under OGTT at 75 g,

to be specific for a prediabetic subject; or

(iii) a combination group of glucose molecules with

characteristic comparative dose-dependent GV dynamics of glucose peak levels at 1030-1041 cm^{-1}, 1080 cm^{-1} and 1118 cm^{-1} during OGTT with different doses at 5 g, 20 g and 75 g, wherein said glucose peaks levels are dose-dependent and well-differentiated between intaken doses of glucose at 5 g, 20 g and 75 g from starting to the ending point of the test;

characteristic predominant high glucose peak levels at 1118 cm-1 over glucose peak levels at 1030-1041 cm^{-1}, 1080 cm^{-1} and 1153 cm^{-1},

characteristic predominant glucose peak position at 1041 cm-1 within 1030-1041 cm^{-1}, characteristic dominant right-shifted mean peak position at 1118 cm^{-1},

characteristic differences in the levels of glucose values and its shifts at 1030-1041 cm^{-1}, 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1} with different glucose doses as compared with characteristic differences for healthy and diabetic subjects,

characteristic single-, bi- and three-phase LTs differences with 0' and 10' at 1030-1041 cm^{-1}, with 10' at 1080 cm^{-1}, with 0', 10' and 25' at 1118 cm^{-1}, with 15' and 25' at 1153 cm^{-1} under OGTT at 5 g,

characteristic single- and bi-phase LTs differences with 0' at 1030-1041 cm^{-1}, with 15' at 1080 cm^{-1}, with 5' at 1118 cm^{-1}, and with 15' and 40' at 1153 cm^{-1} under OGTT at 20 g, characteristic single-phase LT's differences with 0' at 1030-1041 cm^{-1}, with 0' at 1080 cm^{-1}, with 0' at 1118 cm^{-1}, with 30' at 1153 cm^{-1} under OGTT at 75 g,

to be specific for a diabetic subject.

14. A glucose molecule selected with characteristic spectral parameter at absorption wave number at 1030 cm-1 or 1041 cm-1 on HATR-FTIR spectrometer for diagnosing disorders of glucose metabolism such as prediabetes and diabetes, or for treating disorders of glucose metabolism such as prediabetes and diabetes, selected from one of the glucose molecules, comprising its spectral characteristics according to Claim 9.

15. A glucose molecule with characteristic spectral parameter at absorption wave number at 1080 cm^{-1} on HATR-FTIR spectrometer for diagnosing disorders of glucose metabolism, such as prediabetes and diabetes, or for treating disorders of glucose metabolism such as prediabetes and diabetes, selected from one of the glucose molecules, comprising its spectral characteristics according to Claim 10.

16. A glucose molecule with characteristic spectral parameter at absorption wave number at 1118 cm^{-1} on HATR-FTIR spectrometer for diagnosing disorders of glucose metabolism such as prediabetes and diabetes, or for treating disorders of glucose metabolism such as prediabetes and diabetes, selected from one of the glucose molecules, comprising its spectral characteristics according to Claim 11.

17. A glucose molecule with characteristic spectral parameter at absorption wave number at 1153 cm^{-1} on HATR-FTIR spectrometer for diagnosing disorders of glucose metabolism such as prediabetes and diabetes, or for treating disorders of glucose metabolism such as prediabetes and diabetes, selected from one of the glucose molecules, comprising its spectral characteristics

according to Claim 12.

18. A combination group of glucose molecules with characteristic spectral parameters at absorption wave number at 1030-1041 cm^{-1}, 1080 cm^{-1}, 1118 cm^{-1} and 1153 cm^{-1} on HATR-FTIR spectrometer for diagnosing disorders of glucose metabolism, such as prediabetes and diabetes, or for treating disorders of glucose metabolism such as prediabetes and diabetes, selected from one of the combinations group, comprising its spectral characteristics according to Claim 13.