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1 **Differences in metabolite profiles caused by pre-analytical**
2 **blood processing procedures**

3

4 Short title: The influence of blood processing on metabolite profiles

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20

21 **Keywords**

22 Metabolomics; Mass spectrometry; Serum; Plasma; Blood processing.

23

24 **Footnote**

25 Shin Nishiumi and Makoto Suzuki are equally contributed as the first author.

26

1 **ABSTRACT**

2 Recently, the use of metabolomic analysis of human serum and plasma for biomarker
3 discovery and disease diagnosis in clinical studies has been increasing. The feasibility
4 of using a metabolite biomarker for disease diagnosis is strongly dependent on the
5 metabolite's stability during pre-analytical blood processing procedures, such as
6 serum or plasma sampling and sample storage prior to centrifugation. However, the
7 influence of blood processing procedures on the stability of metabolites has not been
8 fully characterized. In the present study, we compared the levels of metabolites in
9 matched human serum and plasma samples using gas chromatography coupled with
10 mass spectrometry and liquid chromatography coupled with mass spectrometry. In
11 addition, we evaluated the changes in plasma metabolite levels induced by storage at
12 room temperature or at a cold temperature prior to centrifugation. As a result, it was
13 found that 76 metabolites exhibited significant differences between their serum and
14 plasma levels. Furthermore, the pre-centrifugation storage conditions significantly
15 affected the plasma levels of 45 metabolites. These results highlight the importance of
16 blood processing procedures during metabolome analysis, which should be considered
17 during biomarker discovery and the subsequent use of biomarkers for disease
18 diagnosis.

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1 INTRODUCTION

2 Clinical biomarkers are required for early disease diagnosis and assessing therapeutic
3 responses, especially in the oncological field (1). In clinical studies, human serum or
4 plasma are easy to obtain and are often used for biomarker discovery and disease
5 diagnosis. Metabolomics is a large-scale approach to the acquisition of comprehensive
6 biological information about low-molecular-weight metabolites (<1,000 Da), which
7 can provide snapshots of patients' physiological and pathological states (2). Thus,
8 metabolomic analysis of human serum or plasma is being increasingly applied to
9 clinical studies (3,4).

10

11 Many analytical methods based on gas chromatography coupled with mass
12 spectrometry (GC/MS) or liquid chromatography coupled with mass spectrometry
13 (LC/MS) have been extensively used for metabolomic analysis (5,6). These analytical
14 techniques focus on a class of compounds, such as carbohydrates, amino acids,
15 organic acids, lipids, or the metabolites associated with a specific pathway.
16 Furthermore, simple metabolite extraction methods can be applied to the stable
17 analysis of blood metabolites (7,8). In metabolomic analysis of serum or plasma,
18 some metabolites might exhibit aberrant changes caused by their degradation,
19 oxidation, or metabolic reactions induced by pre-analytical blood processing. In
20 serum, varying amounts of blood cell-derived metabolites, such as sphingosine 1-
21 phosphate, are released during the coagulation cascade (9). In addition, the hydrolysis
22 of phospholipids, triacylglycerols, and diacylglycerols by lipases, and the hydrolysis
23 of cholesterol esters by esterases can also occur in serum (10). Therefore, pre-
24 analytical techniques, including serum/plasma sampling methods and storage
25 conditions, can have important effects on data quality.

1

2 Carefully following the standard operating procedures (SOP) can reduce the extent to
3 which bias affects the quality of metabolomic data (11). As long as the same blood
4 preparation procedures are used, serum and plasma should generate similar results in
5 clinical and biological studies (12,13). However, the metabolites whose levels were
6 measured in previous studies only represent a small part of the blood metabolome.

7 Accordingly, it is necessary to determine whether serum and plasma analyses produce
8 similar results for a wide variety of metabolites. The storage temperature is another
9 important factor affecting sample stability. In metabolomic analysis, storing blood
10 tubes at 4°C has been shown to be a reliable method for reducing the variability
11 associated with the period prior to sample pre-processing (14). However, many of the
12 currently used SOP have limitations in terms of the intermediate storage period
13 between sample collection and centrifugation. In the clinical setting, the time between
14 the collection of plasma samples and their storage at cold temperatures varies (even
15 though plasma samples should be stored immediately after blood collection).

16 Furthermore, the time for which blood tubes are stored in cold transportation
17 containers prior to centrifugation differs among clinical institutions. The influence of
18 the intermediate storage period on the stability of metabolites should be considered
19 during biomarker discovery and the application of biomarkers to disease diagnosis.

20

21 In the present study, we compared the levels of metabolites in matched human serum
22 and plasma samples by using GC/MS to analyze hydrophilic metabolites and LC/MS
23 to analyze lipids, cationic metabolites, and anionic metabolites. In addition, we
24 evaluated the effects of the time for which plasma samples were stored at room
25 temperature or cold temperature on plasma metabolite levels.

1

2 **MATERIALS AND METHODS**

3 **Chemicals**

4 Pyridine, ultrapure water, acetonitrile (LC/MS grade), chloroform, ammonium acetate
5 (1 M solution, high-performance liquid chromatography grade), formic acid (LC/MS
6 grade), and acetic acid (LC/MS grade) were purchased from Wako Pure Chemical
7 Industries, Ltd. (Osaka, Japan), and methanol (LC/MS grade) was obtained from
8 Kanto Chemical Co., Inc. (Tokyo, Japan). Methoxyamine hydrochloride and
9 tributylamine were purchased from Sigma-Aldrich (MO, USA). *N*-methyl-*N*-
10 (trimethylsilyl)trifluoroacetamide (MSTFA) was acquired from GL Sciences, Inc.
11 (Tokyo, Japan). 2-isopropylmalic acid, which was purchased from Sigma-Aldrich
12 (MO, USA), was used as an internal standard for the GC/MS analysis of hydrophilic
13 metabolites. Dilauroylphosphatidylcholine (PC 12:0-12:0), which was purchased from
14 Avanti Polar Lipids (AL, USA), was used as an internal standard for the lipid analysis,
15 whereas 2-bromohypoxanthine and 10-camphorsulfonate, which were purchased from
16 Sigma-Aldrich (MO, USA), were used as internal standards for the analysis of
17 cationic and anionic metabolites, respectively.

18

19 **Samples**

20 The human samples were collected in accordance with the guidelines of Kobe
21 University Hospital. The serum and plasma samples were prepared from blood
22 samples using the standard venous blood sampling protocol, which has been used for
23 many years in the clinical site. The matched serum and plasma samples that were kept
24 at room temperature before being centrifuged were obtained from 3 healthy volunteers.
25 In addition, plasma samples that were collected from a healthy volunteer were used to

1 assess the influence of the duration of the cold temperature storage period on the
2 results of metabolomic analysis, as shown in Figure 1. To prepare the serum samples,
3 blood samples were collected in blood tubes containing a clotting activator and
4 separation gel and were gently mixed and kept at room temperature for more than
5 30 min until they had completely coagulated. To prepare the plasma samples, blood
6 samples were collected in blood tubes containing ethylenediaminetetraacetic acid
7 (EDTA)-2Na and were gently mixed and kept at room temperature for 0, 15, or
8 30 min or at a cold temperature, which was kept by using Cube Cooler (FORTE
9 GROW MEDICAL, Tochigi, Japan) , for 1, 4, or 8 h. Then, the blood tubes were
10 centrifuged at 2,270 x g for 10 min at 4°C, and the serum and plasma were transferred
11 to clean tubes and stored at -80°C before being used.

12

13 **Extraction procedure**

14 To extract hydrophilic metabolites prior to the GC/MS analysis, 50 µL of serum or
15 plasma were mixed with 250 µL of methanol and 10 µL of 2-isopropylmalic acid
16 (0.5 mg/mL) as an internal standard. Then, the mixture was shaken at 1,200 rpm for
17 30 min at 37°C, before being centrifuged at 19,300 ×g for 3 min at 4°C. Two hundred
18 and twenty-five µL of the obtained supernatant were transferred to a clean tube,
19 before being lyophilized using a freeze dryer. For oximation, 80 µL of 20 mg/ml
20 methoxyamine hydrochloride dissolved in pyridine were added to the tube and then
21 sonicated for 20 min, before being shaken at 1,200 rpm for 90 min at 30°C. Then,
22 40 µL of MSTFA were added, and then the mixture was incubated at 1,200 rpm for 30
23 min at 37 °C. After the mixture had been centrifuged at 19,300 ×g for 5 min at room
24 temperature, the resultant supernatant was subjected to GC/MS.

25

1 For the lipid analysis using LC/MS, 10 μ L of serum or plasma were mixed with 80 μ L
2 of methanol and 10 μ L of 500 ppb PC 12:0-12:0 dissolved in methanol as an internal
3 standard, and then the solution was centrifuged at 16,000 \times g for 5 min at 4°C. The
4 resultant supernatant was subjected to LC/MS analysis.

5
6 To extract cationic and anionic metabolites prior to the LC/MS analysis, 50 μ L of
7 serum or plasma were mixed with 900 μ L of a solvent mixture
8 (methanol : water : chloroform = 2.5:1:1) containing 1 μ M 2-bromohypoxanthine and
9 10-camphorsulfonate as internal standards. The mixture was subsequently shaken at
10 1,400 rpm for 30 min at 37°C, before being centrifuged at 16,000 \times g for 3 min at 4°C.
11 The resultant supernatant (630 μ L) was transferred to a clean tube. Then, 280 μ L of
12 water were added, and the mixture was mixed well. After the mixture had been
13 centrifuged at 16,000 \times g for 5 min at 4°C, 500 μ L of the resultant supernatant were
14 centrifugally filtrated through a 3-kDa filter device (Millipore, MA, USA) at
15 14,000 \times g for 1 h to remove any proteins. The filtrate was lyophilized using a freeze
16 dryer, dissolved in water, and analyzed by LC/MS.

17

18 **GC/MS analysis**

19 The GC/MS analysis was carried out on a GCMS-TQ8040 system (Shimadzu Co.).
20 Each sample was injected at a split ratio of 1:10, and then the separation was
21 performed on a fused silica capillary column (BPX5; inner diameter: 30 m \times 0.25 mm,
22 film thickness: 0.25 μ m; SGE Analytical Science). The front inlet temperature was
23 250°C. Helium gas was used as the GC carrier gas, and argon gas was used as a
24 collision-induced dissociation gas. The flow rate of helium gas through the column
25 was 39.0 cm/s. The column temperature was kept at 80°C for 2 min and then raised by

1 15°C/min to 330°C, before being kept at 330°C for 3 min. The transfer line and ion-
2 source temperatures were 280°C and 200°C, respectively.

3

4 **LC/MS analysis**

5 The LC/MS/MS analyses were performed using a Nexera LC system (Shimadzu
6 Corp.) equipped with two LC-30AD pumps, a DGU-20A₅ degasser, an SIL-30AC
7 autosampler, a CTO-20AC column oven, and a CBM-20A control module, coupled
8 with an LCMS-8040 triple quadrupole mass spectrometer (Shimadzu Corp.). The
9 mass spectrometer was equipped with an electrospray ionization source under the
10 following conditions: nebulizing gas flow rate, 3 L/min; desolvation line temperature,
11 250°C; heat block temperature, 400°C; drying gas flow rate, 15 L/min; interface
12 voltage for positive mode, +4.5 kV; and interface voltage for negative mode, -3.5 kV.
13 The collision-induced dissociation gas pressure was set at 230 kPa.

14

15 Lipids were separated using an octadecylsilylated silica (ODS) column (InertSustain
16 C18, 100 mm × 2.1 mm, 3 μm; GL Sciences, Tokyo, Japan) and a guard column
17 (10 mm × 3 mm, 5 μm). The mobile phase for hydrophobic metabolites consisted of
18 A: 20 mM ammonium acetate in water and B: methanol. The flow rate was
19 0.4 mL/min, and the column oven temperature was 40°C. The gradient program for
20 mobile phase B was as follows: 0 min, 80%; 13 min, 98%; 30 min, 98%; 30.1 min,
21 80%; and 35 min, 80%. Blank runs (involving the injection of isopropanol) between
22 the actual sample runs were employed to remove any carry-over contamination.

23

24 The cation analysis was carried out using a pentafluorophenylpropyl column
25 (Discovery HS F5, 150 × 2.1 mm, 3 μm; SUPELCO, PA, USA) and a guard column

1 (20 × 2.1 mm, 3 μm). The mobile phase for the cation analysis was composed of A:
2 0.1% formic acid in water and B: acetonitrile. The flow rate was 0.3 mL/min, and the
3 column oven temperature was 40°C. The gradient program for mobile phase B was as
4 follows: 0 min, 0%; 7 min, 0%; 20 min, 40%; 20.1 min, 100%; 25 min, 100%;
5 25.1 min, 0%; and 35 min, 0%.

6

7 The anion analysis was performed using an ODS column (InertSustain C18, 150 ×
8 2.1 mm, 3 μm; GL Sciences, Tokyo, Japan). The mobile phase for the anion analysis
9 consisted of A: water containing 15 mM acetic acid and 10 mM tributylamine, and B:
10 methanol. The flow rate was 0.3 mL/min, and the column oven temperature was 35°C.
11 The gradient program for mobile phase B was as follows: 0 min, 0%; 0.5 min, 0%;
12 20 min, 75%; 20.1 min, 98%; 24 min, 98%; 24.1 min, 0%; and 30 min, 0%.

13

14 **Data analysis**

15 Metabolite peaks were extracted from the GC/MS dataset using the Smart Metabolites
16 Database (Shimadzu, Co.), which contained the relevant multiple reaction monitoring
17 (MRM) method file and data regarding the GC analytical conditions, MRM
18 parameters, and the retention index employed for the metabolite measurement. To
19 correct the retention time, the Automatic Adjustment of Retention Time (AART)
20 function of the GCMSsolution software (Shimadzu Co.) and a standard alkane series
21 mixture (C7 to C33) were used. The peak identification was performed automatically,
22 and then the peaks were confirmed manually based on the specific precursor and
23 product ions, and the retention time.

24

1 The lipids detected by LC/MS were putatively identified based on multiple reaction
2 monitoring transitions and their retention times using an in-house library, which
3 targeted phospholipids, acylcarnitines (AC), fatty acids (FA), and bile acids (15). The
4 phospholipids included in the library were verified based on the precursor m/z and a
5 head group-specific positive fragment (m/z 184.1) for phosphocholines (PC) or head
6 group-specific neutral loss (NL 141) for phosphoethanolamines (PE). The structural
7 details of the constituent FA were assigned based on the numbers of C-atoms and
8 double bonds in their negative fragments. The AC included in the library were
9 verified based on the precursor m/z and a specific positive fragment (m/z 85.05). The
10 FA and bile acids included in the library were identified using authentic chemical
11 standards. Peak selection and integration were performed automatically using the
12 MRMPROBS (16), and the results were then checked manually.

13

14 The cationic and anionic metabolites detected by LC/MS were identified based on the
15 precursor ions, single specific product ions, and retention times produced by authentic
16 chemical standards during analyses involving the same analytical methods (15). Peak
17 selection and integration were carried out automatically using the LabSolutions
18 software (ver. 5.65; Shimadzu Corp.), and the results were then checked manually.

19

20 The peak area of each metabolite was normalized to that of the internal standard. Then,
21 the obtained corrected peak area values were statistically evaluated using EZR, which
22 is a graphical user interface for the software R (17). Metabolites whose serum and
23 plasma levels differed significantly were identified using the paired Student's *t* test (p
24 <0.05). Significant changes in the plasma levels of metabolites caused by the storage
25 conditions were identified using one-way repeated measures ANOVA ($p <0.05$). In

1 our study, the process of multi comparison was not performed, because our study is
2 the exploratory analysis and, is also needed to avoid the confusion in data evaluation.

3

4 **RESULTS AND DISCUSSION**

5 To evaluate the disease-specific changes in the serum or plasma levels of metabolites,
6 it is critical to understand the influence of pre-analytical factors, such as degradation,
7 oxidation, or metabolic reactions. Furthermore, serum can contain varying amounts of
8 blood cell-derived metabolites that are released during the coagulation cascade.

9 Plasma separation is carried out along with anticoagulation, and this process is usually
10 able to be performed at the cooling condition. Therefore, the concentrations of
11 metabolites may be less affected by plasma preparation compared with serum
12 preparation. From this viewpoint, collecting procedures of plasma were evaluated in
13 addition to the comparison between serum and plasma metabolite levels.

14

15 In our study, serum and plasma were analyzed (using GC/MS to analyze hydrophilic
16 metabolites and LC/MS to analyze lipids, cationic metabolites, and anionic
17 metabolites) to investigate the differences between their metabolite profiles (Figure
18 1A). As a result, 104, 213, 44, and 37 metabolites were detected during the analyses
19 of hydrophilic metabolites with GC/MS and lipids, cationic metabolites, and anionic
20 metabolites with LC/MS, respectively (Supplementary Table S1). Of these
21 metabolites, 76 exhibited significant differences between their plasma and serum
22 levels (Figure 2). They included carbohydrates, organic acids, amino acids, lyso-PC
23 (LPC), PC, PE, FA, and AC. Most carbohydrates, amino acids, and their derivatives
24 exhibited higher levels in serum than in plasma. In addition, the lipid species, except
25 for LPC, displayed the same tendency. Coagulation is the process by which blood

1 changes from a liquid to a gel to form a blood clot, which can lead to the enrichment
2 of metabolites, such as carbohydrates, amino acids, and lipid species, in serum due to
3 a reduction in liquid volume compared with that seen in anticoagulated plasma. In the
4 cationic metabolite analysis, guanosine was only detected in the serum samples. This
5 indicated that some metabolites might be released from blood cells via the coagulation
6 cascade during the serum preparation process. On the other hand, the reductions in the
7 serum levels of some metabolites observed in this study might have been caused by
8 the consumption of the metabolites in metabolic reactions by enzymes released from
9 blood cells during clotting. In a previous study, Wedge et al. indicated that the
10 majority of metabolites demonstrated similar levels of inter-subject variation in both
11 serum and plasma, although the levels of specific metabolites displayed different
12 distributions (18). To determine whether metabolite biomarkers found in
13 plasma/serum can be used to obtain clinical diagnoses via analyses of the other fluid
14 (i.e., serum and plasma, respectively), it is crucial to verify the influence of blood
15 processing techniques, as was shown in our study.

16

17 The exposure of plasma samples in collection tubes to room temperature or their
18 prolonged storage at cold temperatures before centrifugation is major risks during pre-
19 analytical processing. Thus, we also evaluated the plasma levels of metabolites
20 according to the period for which the samples were stored at room temperature (the
21 room temperature storage period; i.e., for 0, 15, or 30 min, in order to simulate the
22 environment during blood collection in medical check-ups, in which the room
23 temperature storage period varies. In addition, we evaluated the levels of metabolites
24 according to the period for which samples were stored at cold temperatures (the cold
25 temperature storage period); i.e., for 1, 4, or 8 h, in order to simulate the storage of

1 blood tubes in cold transportation containers prior to centrifugation, which is assumed
2 to differ among clinical institutions (Figure 1B). As a result, 89, 213, 43, and 37
3 metabolite peaks were commonly detected during the analysis of hydrophilic
4 metabolites with GC/MS and the analysis of lipids, cationic metabolites, and anionic
5 metabolites with LC/MS, respectively (Supplementary Table S2). Of these
6 metabolites, the levels of 45 metabolites were significantly affected by the storage
7 conditions (Figure 3, Supplementary Figure S1). The levels of sucrose and pyruvic
8 acid increased markedly with the room temperature storage period. The level of
9 sucrose did not change when the samples were stored at cold temperatures. In contrast,
10 the level of pyruvic acid fell as the cold temperature storage period increased. Pyruvic
11 acid is involved in primary metabolic pathways, such as glycolysis (19), and the
12 associated metabolic activity in blood cells might affect the production of metabolites
13 in plasma prior to centrifugation. Moreover, the enzymatic consumption or non-
14 enzymatic conversion of metabolites might occur even at cold temperatures. The
15 level of hypoxanthine increased with the duration of the period before centrifugation
16 regardless of whether the samples were stored at room temperature or cold
17 temperature. Yin et al. reported that the plasma level of hypoxanthine increased when
18 freshly collected blood samples were exposed to room temperature before
19 centrifugation (20), which is in line with our results. The high level of hypoxanthine
20 observed in plasma was considered to be derived from blood erythrocytes and
21 platelets (21), which can release hypoxanthine into plasma after blood collection,
22 depending on the duration of the period between sample collection and the removal of
23 blood cells by centrifugation.
24

1 In both GC/MS and LC/MS analyses of our study, the internal standards were used in
2 the metabolite extraction step, and then were analyzed along with the blood
3 metabolites. As a result, the internal standards were stably detected among all samples
4 (data not shown). These results indicate the following: Our comprehensive metabolite
5 analyzing system itself is no problem, but some metabolites had the different
6 analytical stability between GC/MS and LC/MS (Supplementary Table S1). For
7 example, threonine, aspartic acid and glutamic acid had the low analytical stability in
8 the LC/MS analysis compared with the GC/MS analysis (Supplementary Table S1). In
9 the case of measuring amino acids by LC/MS, the derivatization step is often selected,
10 although it was not performed in the study due to the comprehensive analysis of blood
11 metabolites including amino acids. LC/MS is relatively weak in analyzing the highly
12 polar molecules, therefore the polarity of the molecules is lowered by derivatization
13 leading to the high separation capacity. The derivatization also leads to an increase in
14 the ionization efficiency. On the other hand, the derivatization step is basically carried
15 out in the GC/MS analysis, although the analytical sensitivity of GC/MS is lower than
16 that of LC/MS. These facts are also important in evaluating our findings and
17 performing exploratory and confirmatory researches about the metabolite biomarkers.

18
19 In conclusion, there are significant differences in the metabolite profiles of serum and
20 plasma. In addition, we have shown that the delay between blood collection and
21 centrifugation and the storage temperature during this period have a significant impact
22 on the metabolite profile of plasma. Almost all large clinical trials involving the
23 validation of biomarker candidates are multicenter studies. The validity and
24 confidence of the conclusions drawn from such studies are highly dependent on the
25 quality of the procedures employed. In terms of analytical processes, quality

1 assurance and quality control processes can ensure the consistency of metabolomic
2 data (22). Most metabolites in plasma are stable at -80°C after centrifugation (23).
3 However, subjecting plasma samples to repeated freeze-thaw cycles affects their
4 metabolite levels (24), which highlights the importance of controlling the
5 experimental conditions using SOP during metabolomic analysis-based biomarker
6 discovery and the subsequent application of the identified biomarkers to disease
7 diagnosis. The current SOP for the blood processing procedures employed before
8 centrifugation in the clinical environment are limited, which might make it difficult to
9 review and make decisions on the quality of metabolomic datasets. Although
10 metabolite profiles are sensitive to pre-analytical blood processing, it is possible to
11 find disease-related biomarker candidates by excluding unstable metabolites from the
12 targets for evaluation. Our findings suggest the following: In the exploratory and
13 confirmatory researches about metabolite biomarkers, it is important to take full
14 account of pre-analytical blood processing procedures. It is preferable to cool
15 immediately after the blood collection and continue the plasma separation promptly,
16 because our study confirmed that some of the metabolites alter depending on the
17 blood treatment time after blood collection. If it is difficult to perform the prompt
18 blood treatment in the clinical practice, the full understandings of the effects of the
19 blood treatment time on the metabolite concentrations are required. Moreover, in the
20 large scale study, stable house hold metabolites may be also important, because stable
21 house hold metabolites are available to evaluate the quality control of each sample
22 and the analytical performance of each analysis batch. The information obtained in
23 this study will contribute to the discovery of reliable biomarker candidates and their
24 application to disease diagnosis. An inter-instrument and inter-laboratory

1 measurement comparison is also important in determining the reliable metabolite
2 biomarkers.

3

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13

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11
12

13 **Figure legends**

14 **Figure 1**

15 Scheme of the pre-analytical blood processing

16 The differences in metabolite profiles caused by serum or plasma sampling were
17 assessed (A). The changes in metabolite profiles caused by storage at room
18 temperature (RT), which simulated the environment of blood collection during
19 medical check-ups (during which the room temperature storage period varies), or at
20 cold temperature (CT), which simulated blood tube storage in a cold transportation
21 container, were assessed (B).

22 **Figure 2**

23 Differences in the levels of metabolites between serum and plasma

1 Metabolites whose plasma and serum levels differed significantly are shown (paired
2 Student's *t* test, $p < 0.05$). The columns represent the serum to plasma metabolite level
3 ratios for each subject.

4 **Figure 3**

5 Significant changes in the plasma levels of metabolites caused by the storage
6 conditions

7 Metabolites whose levels were significantly altered (one-way repeated measures
8 ANOVA, $p < 0.05$) by storage at room temperature or cold temperature are shown.

9 The plots represent the geometric mean ratio of the plasma metabolite level to the
10 level seen at 0 min at room temperature or at 1 h at cold temperature. The results of
11 Figure 3 are also visualized with the heat map in Figure S1.

12

13 **Supplementary materials**

14 **Table S1**

15 Comparison of the levels of metabolites in serum and plasma according to GC/MS
16 and LC/MS

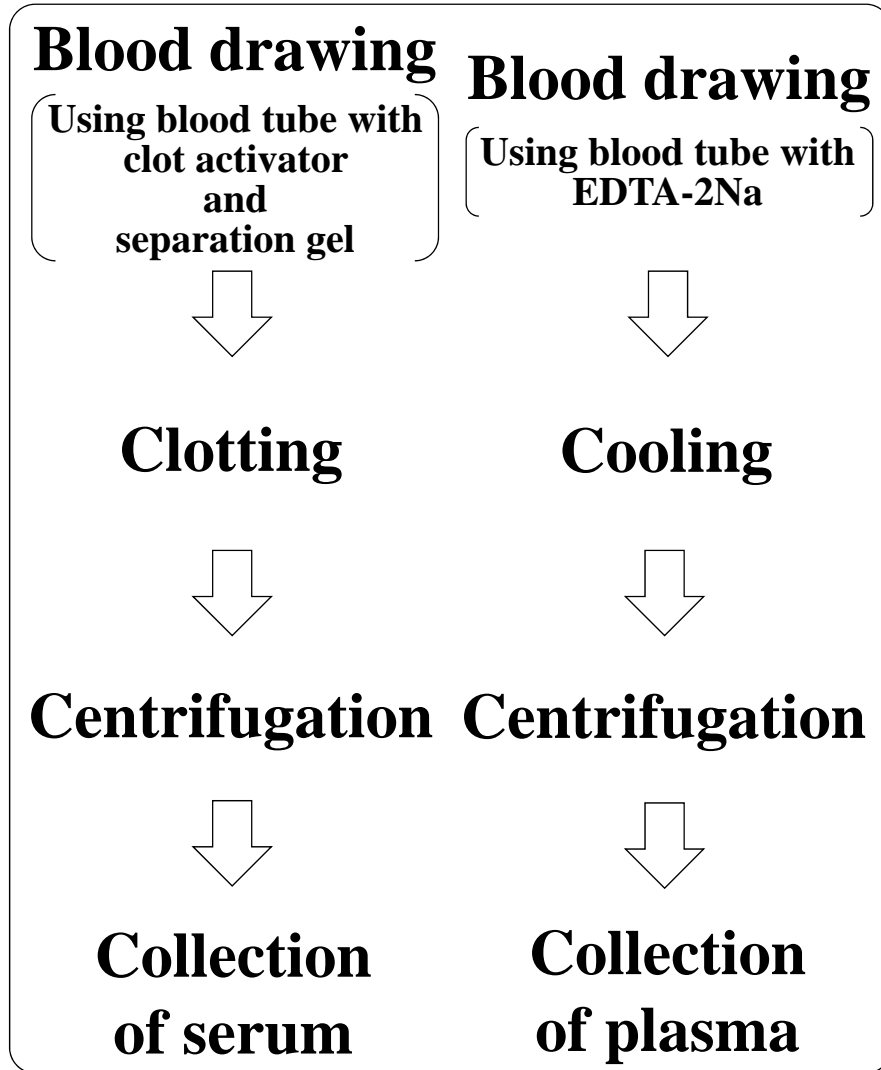
17 **Table S2**

18 Differences in the plasma levels of metabolites caused by storage at room temperature
19 or at cold temperature

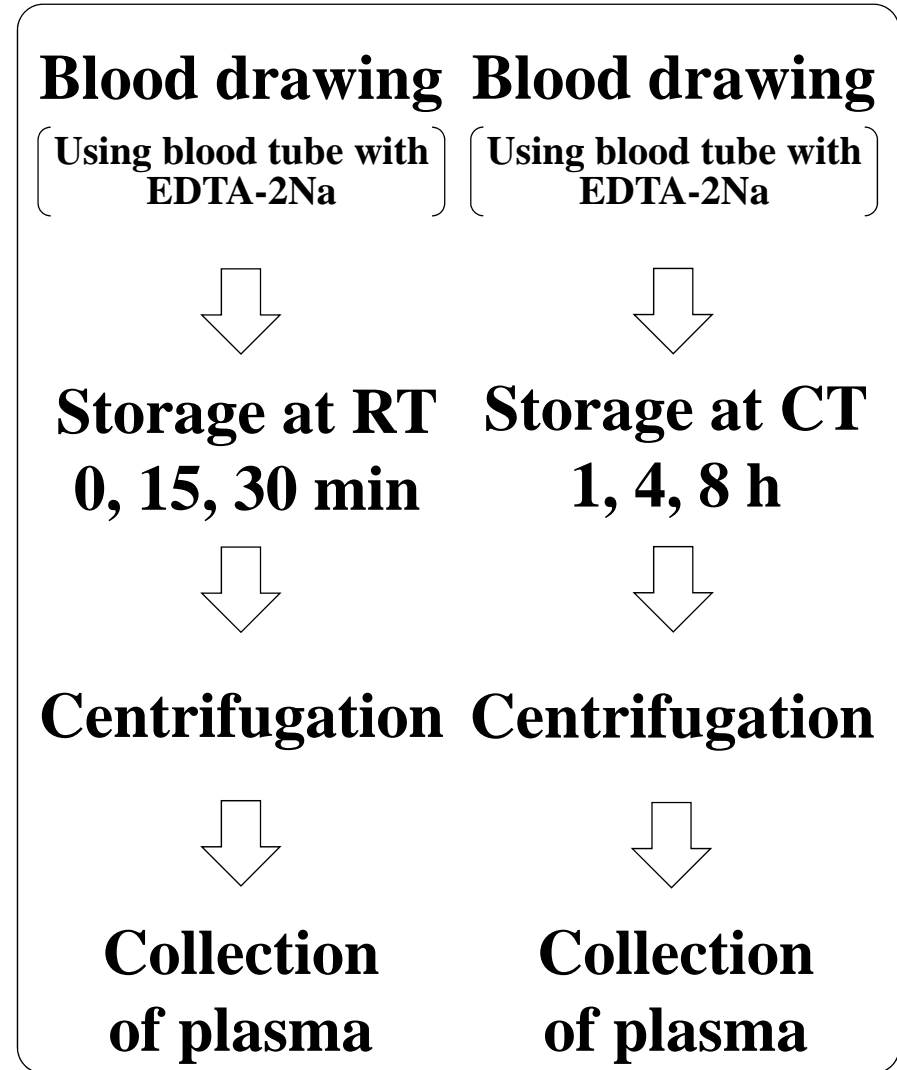
20 **Figure S1**

21 Heat map visualization of the significant changes in the plasma levels of metabolites
22 caused by the storage conditions

(A)



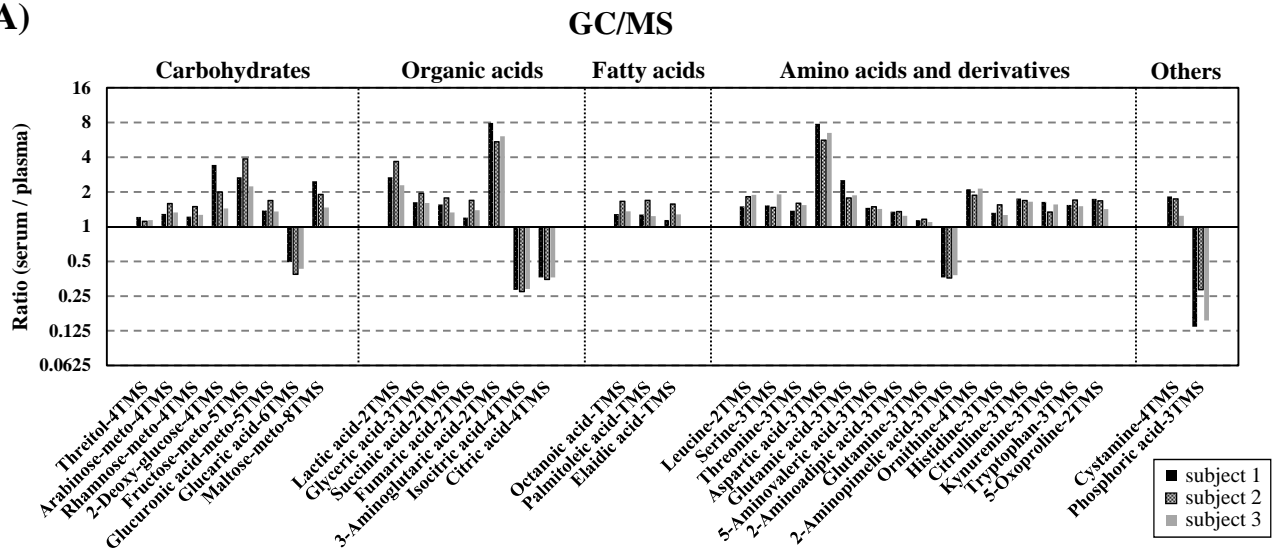
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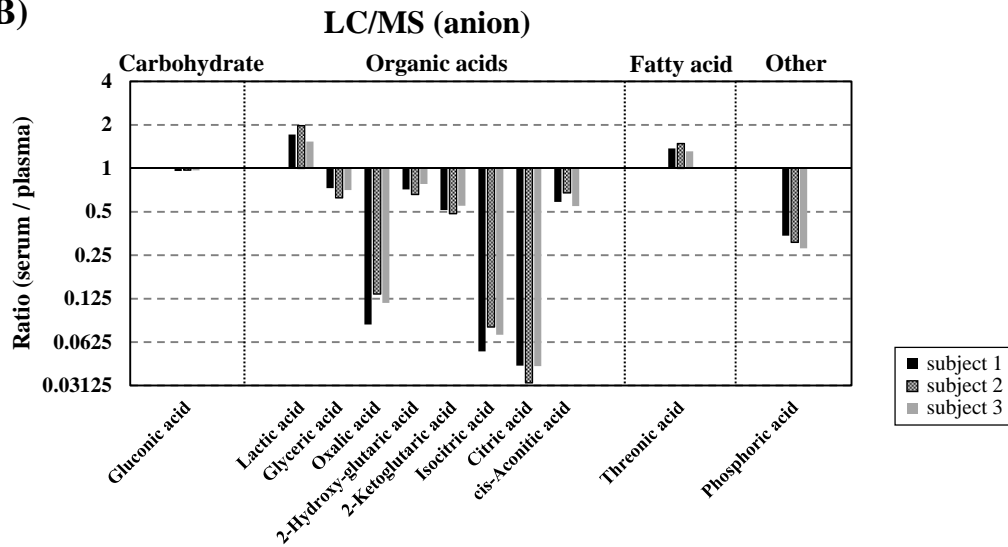
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Metabolome analysis

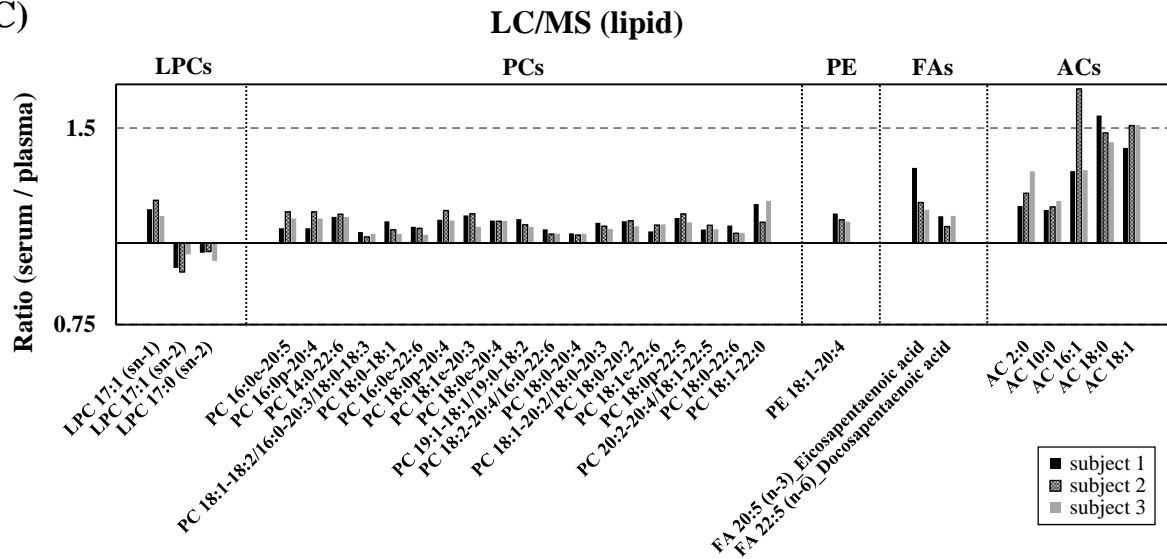
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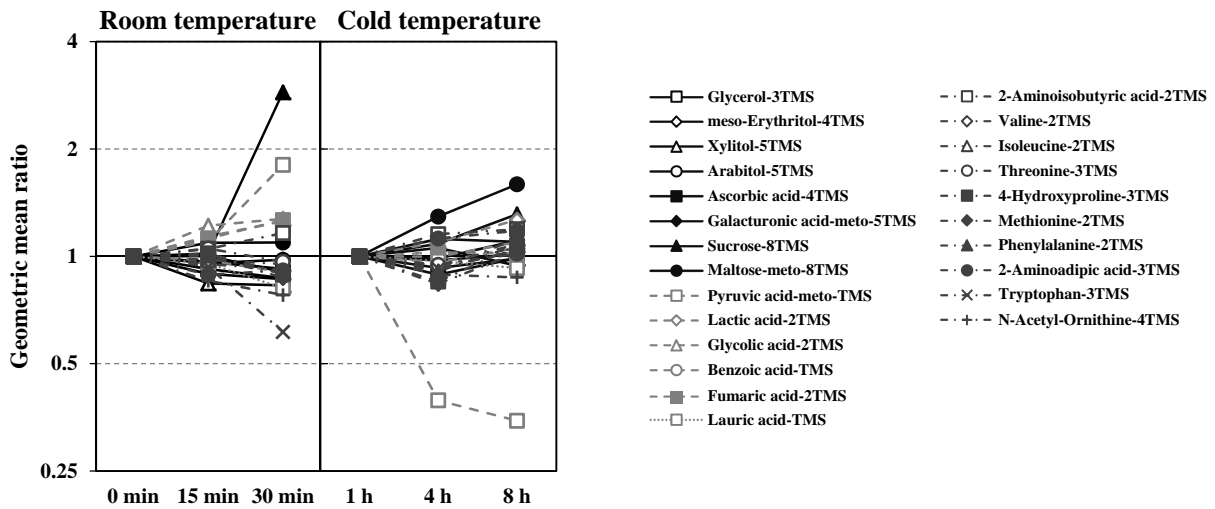
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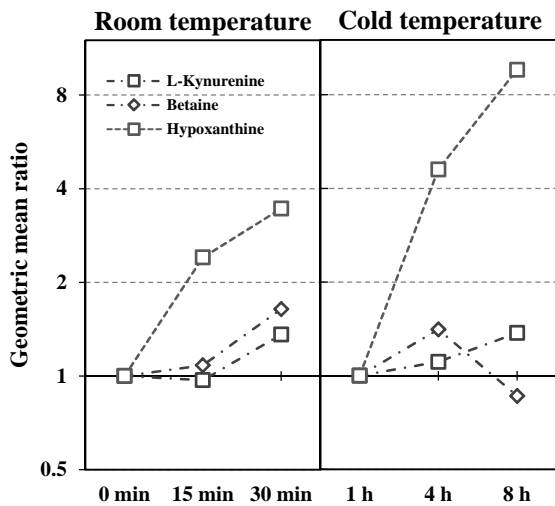
(C)



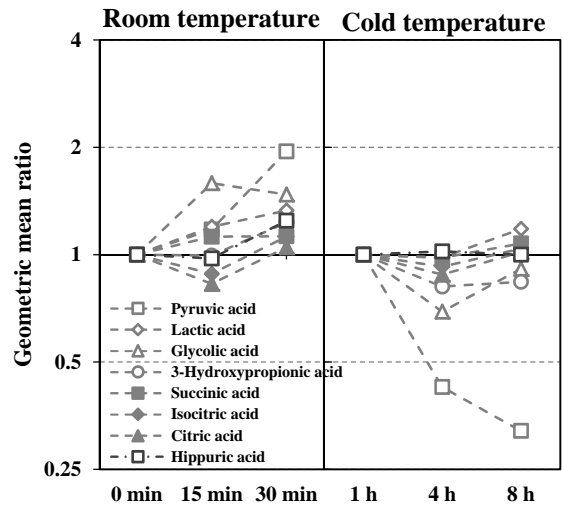
(A) GC/MS



(B) LC/MS (cation)



(C) LC/MS (anion)



(D) LC/MS (lipid)

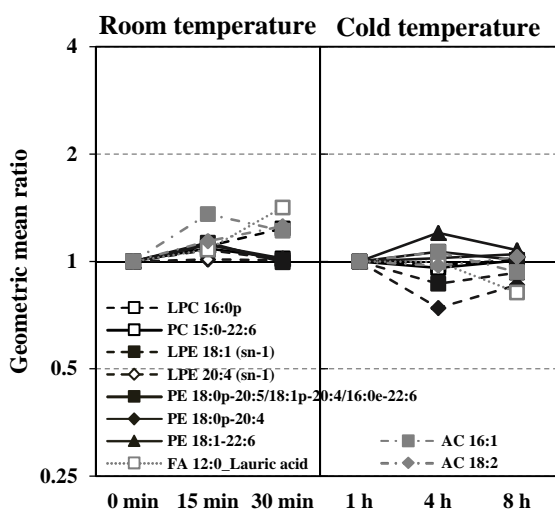


Table S1
 Comparison of the levels of metabolites in serum and plasma by using GC/MS and LC/MS

Metabolite	Method	Corrected peak area						Ratio (Serum level / Plasma level)			p-value
		Serum			Plasma			subject 1	subject 2	subject 3	
		subject 1	subject 2	subject 3	subject 1	subject 2	subject 3				
Pyruvic acid-meto-TMS	GC/MS	1.03.E-01	1.60.E-01	3.27.E-01	1.07.E-01	1.52.E-01	2.61.E-01	0.970	1.052	1.254	0.386
Lactic acid-2TMS	GC/MS	5.36.E+00	5.88.E+00	5.97.E+00	2.00.E+00	1.60.E+00	2.61.E+00	2.679	3.679	2.284	0.007
Glycolic acid-2TMS	GC/MS	8.72.E-02	1.02.E-01	8.21.E-02	8.54.E-02	7.20.E-02	8.01.E-02	1.020	1.414	1.026	0.351
Alanine-2TMS	GC/MS	8.69.E-01	8.33.E-01	1.20.E+00	6.59.E-01	4.87.E-01	6.38.E-01	1.319	1.710	1.880	0.068
2-Keto-isovaleric acid-meto-TMS	GC/MS	1.47.E-02	2.15.E-02	1.72.E-02	1.39.E-02	1.44.E-02	1.44.E-02	1.064	1.491	1.198	0.188
Glycine-2TMS	GC/MS	1.70.E-02	1.15.E-02	1.80.E-02	1.79.E-02	1.39.E-02	1.76.E-02	0.947	0.828	1.022	0.343
2-Hydroxybutyric acid-2TMS	GC/MS	1.99.E-01	3.20.E-01	2.15.E-01	1.65.E-01	1.87.E-01	1.65.E-01	1.205	1.718	1.301	0.145
Sarcosine-2TMS	GC/MS	1.06.E-01	1.55.E-01	1.15.E-01	9.26.E-02	9.85.E-02	9.14.E-02	1.143	1.572	1.254	0.141
2-Aminoisobutyric acid-2TMS	GC/MS	6.50.E-02	7.92.E-02	5.89.E-02	4.42.E-02	4.10.E-02	4.52.E-02	1.469	1.931	1.302	0.080
3-Hydroxybutyric acid-2TMS	GC/MS	3.12.E-01	9.35.E-01	3.80.E-01	2.52.E-01	5.44.E-01	2.78.E-01	1.235	1.720	1.369	0.219
2-Aminobutyric acid-2TMS	GC/MS	3.03.E-02	6.02.E-02	2.83.E-02	2.40.E-02	3.66.E-02	1.95.E-02	1.265	1.643	1.451	0.138
3-Hydroxyisovaleric acid-2TMS	GC/MS	5.95.E-02	1.31.E-01	7.15.E-02	5.05.E-02	8.00.E-02	5.94.E-02	1.177	1.634	1.204	0.217
Valine-2TMS	GC/MS	8.76.E+00	1.20.E+01	9.83.E+00	7.13.E+00	7.87.E+00	7.07.E+00	1.230	1.522	1.389	0.058
Urea-2TMS	GC/MS	4.97.E+00	9.28.E+00	4.56.E+00	4.33.E+00	5.93.E+00	3.64.E+00	1.149	1.564	1.252	0.197
2-Aminoethanol-3TMS	GC/MS	3.96.E-01	4.25.E-01	3.79.E-01	3.46.E-01	2.78.E-01	3.39.E-01	1.144	1.529	1.120	0.146
Benzoic acid-TMS	GC/MS	3.19.E-02	4.33.E-02	3.26.E-02	2.96.E-02	2.90.E-02	2.88.E-02	1.078	1.491	1.133	0.212
Glycerol-3TMS	GC/MS	6.22.E-01	8.76.E-01	7.60.E-01	5.74.E-01	6.43.E-01	7.61.E-01	1.083	1.362	1.000	0.319
Leucine-2TMS	GC/MS	5.15.E+00	6.59.E+00	5.45.E+00	3.44.E+00	3.61.E+00	2.89.E+00	1.500	1.824	1.888	0.023
Octanoic acid-TMS	GC/MS	5.76.E-02	6.43.E-02	6.61.E-02	4.47.E-02	3.88.E-02	4.86.E-02	1.288	1.660	1.359	0.037
Phosphoric acid-3TMS	GC/MS	7.76.E-01	1.31.E+00	7.06.E-01	5.72.E+00	4.61.E+00	4.60.E+00	0.136	0.285	0.154	0.014
Isoleucine-2TMS	GC/MS	2.16.E+00	2.97.E+00	2.59.E+00	1.78.E+00	1.91.E+00	1.68.E+00	1.217	1.557	1.540	0.062
Proline-2TMS	GC/MS	3.28.E+00	4.46.E+00	4.05.E+00	2.57.E+00	3.02.E+00	2.17.E+00	1.276	1.476	1.867	0.059
Succinic acid-2TMS	GC/MS	4.26.E-02	3.62.E-02	4.29.E-02	2.74.E-02	2.04.E-02	3.22.E-02	1.557	1.776	1.329	0.014
Glyceric acid-3TMS	GC/MS	9.82.E-02	1.28.E-01	1.08.E-01	6.02.E-02	6.55.E-02	6.74.E-02	1.630	1.951	1.602	0.026
Uracil-2TMS	GC/MS	1.88.E-03	1.61.E-03	2.01.E-03	1.32.E-03	1.99.E-03	1.93.E-03	1.423	0.809	1.039	0.786
Serine-3TMS	GC/MS	1.66.E+00	1.63.E+00	1.70.E+00	1.08.E+00	1.11.E+00	8.91.E-01	1.530	1.472	1.904	0.018
Fumaric acid-2TMS	GC/MS	1.69.E-02	1.48.E-02	1.83.E-02	1.40.E-02	8.77.E-03	1.32.E-02	1.200	1.692	1.388	0.040
Homoserine-2TMS	GC/MS	1.99.E-03	1.35.E-03	1.84.E-03	1.27.E-03	1.37.E-03	1.78.E-03	1.565	0.979	1.034	0.400
Nonanoic acid-TMS	GC/MS	7.86.E-02	7.90.E-02	7.79.E-02	6.75.E-02	4.77.E-02	6.50.E-02	1.165	1.655	1.198	0.104
Threonine-3TMS	GC/MS	3.14.E-01	3.97.E-01	4.62.E-01	2.28.E-01	2.48.E-01	3.00.E-01	1.377	1.597	1.541	0.030
Glutaric acid-2TMS	GC/MS	1.49.E-03	7.89.E-03	2.86.E-03	1.32.E-03	4.61.E-03	2.19.E-03	1.130	1.712	1.305	0.291
Threitol-4TMS	GC/MS	4.45.E-03	3.29.E-03	5.32.E-03	3.67.E-03	2.95.E-03	4.66.E-03	1.214	1.113	1.141	0.047
Malic acid-3TMS	GC/MS	3.86.E-03	2.94.E-03	3.69.E-03	2.50.E-03	2.80.E-03	3.43.E-03	1.548	1.047	1.076	0.274
meso-Erythritol-4TMS	GC/MS	1.12.E-02	2.23.E-02	1.61.E-02	1.04.E-02	1.42.E-02	1.37.E-02	1.078	1.574	1.169	0.234
Aspartic acid-3TMS	GC/MS	2.46.E-02	2.46.E-02	2.53.E-02	3.16.E-03	4.38.E-03	3.88.E-03	7.807	5.634	6.513	0.000
3-Aminoglutaric acid-2TMS	GC/MS	1.45.E-01	1.48.E-01	1.56.E-01	1.82.E-02	2.71.E-02	2.57.E-02	7.964	5.454	6.079	0.001
4-Hydroxyproline-3TMS	GC/MS	3.47.E-01	5.04.E-01	2.69.E-01	2.90.E-01	3.46.E-01	2.09.E-01	1.198	1.453	1.285	0.109
Methionine-2TMS	GC/MS	3.82.E-02	5.01.E-02	4.83.E-02	3.18.E-02	3.18.E-02	3.52.E-02	1.200	1.576	1.373	0.068
4-Aminobutyric acid-3TMS	GC/MS	4.66.E-03	5.46.E-03	5.42.E-03	3.84.E-03	3.34.E-03	6.66.E-03	1.213	1.634	0.814	0.622
5-Oxoproline-2TMS	GC/MS	2.96.E-01	1.96.E-01	2.96.E-01	1.69.E-01	1.17.E-01	2.08.E-01	1.744	1.675	1.419	0.022
Pyrogallol-3TMS	GC/MS	2.00.E-02	4.17.E-03	5.16.E-02	1.64.E-02	2.68.E-03	4.30.E-02	1.219	1.556	1.202	0.164
Cysteine-3TMS	GC/MS	1.85.E-01	2.25.E-01	2.47.E-01	2.41.E-01	2.40.E-01	3.46.E-01	0.770	0.937	0.712	0.146
Creatinine-3TMS	GC/MS	5.08.E-02	7.54.E-02	5.12.E-02	2.57.E-02	2.67.E-02	2.63.E-02	1.976	2.820	1.950	0.053
2-Ketoglutaric acid-meto-2TMS	GC/MS	3.71.E-02	2.96.E-02	5.43.E-02	3.98.E-02	2.94.E-02	4.98.E-02	0.933	1.008	1.091	0.771
Glutamic acid-3TMS	GC/MS	3.93.E-01	3.12.E-01	5.60.E-01	1.55.E-01	1.76.E-01	2.99.E-01	2.536	1.776	1.869	0.031
5-Aminovaleric acid-3TMS	GC/MS	9.13.E-03	6.53.E-03	7.45.E-03	6.26.E-03	4.38.E-03	5.22.E-03	1.458	1.492	1.427	0.009
Phenylalanine-2TMS	GC/MS	1.37.E+00	1.65.E+00	1.42.E+00	1.08.E+00	1.01.E+00	1.10.E+00	1.268	1.637	1.289	0.066
Xylose-meto-4TMS	GC/MS	4.60.E-03	6.52.E-03	5.13.E-03	3.51.E-03	3.91.E-03	3.95.E-03	1.312	1.670	1.299	0.081
Arabinose-meto-4TMS	GC/MS	1.73.E-02	2.17.E-02	2.04.E-02	1.34.E-02	1.36.E-02	1.54.E-02	1.289	1.589	1.326	0.045
Ribulose-meto-4TMS	GC/MS	8.04.E-03	9.56.E-03	8.33.E-03	7.72.E-03	6.39.E-03	7.91.E-03	1.041	1.495	1.053	0.298
Lauric acid-TMS	GC/MS	7.93.E-02	9.93.E-02	5.74.E-02	6.24.E-02	6.19.E-02	4.48.E-02	1.272	1.604	1.281	0.100
Ribose-meto-4TMS	GC/MS	6.52.E-03	1.20.E-02	7.96.E-03	3.94.E-03	3.82.E-03	3.55.E-03	1.657	3.153	2.245	0.092
Homocysteine-3TMS	GC/MS	9.11.E-03	6.44.E-03	7.16.E-03	9.77.E-03	6.50.E-03	7.23.E-03	0.932	0.990	0.990	0.315
Asparagine-3TMS	GC/MS	5.73.E-02	4.98.E-02	6.12.E-02	4.10.E-02	4.76.E-02	4.63.E-02	1.395	1.047	1.324	0.130
Xylitol-5TMS	GC/MS	1.59.E-02	5.20.E-02	2.47.E-02	1.41.E-02	3.29.E-02	2.07.E-02	1.132	1.583	1.192	0.266
Arabitol-5TMS	GC/MS	1.68.E-02	5.52.E-02	2.51.E-02	1.45.E-02	3.40.E-02	2.13.E-02	1.153	1.627	1.181	0.274

Ribitol-5TMS	GC/MS	3.73.E-03	5.04.E-03	4.67.E-03	2.98.E-03	3.14.E-03	3.71.E-03	1.249	1.607	1.257	0.078
1,6-Anhydroglucose-3TMS	GC/MS	3.12.E-03	1.11.E-03	1.51.E-03	2.73.E-03	6.23.E-04	1.47.E-03	1.143	1.782	1.028	0.152
Rhamnose-meto-4TMS	GC/MS	4.57.E-03	3.15.E-03	2.98.E-03	3.74.E-03	2.11.E-03	2.35.E-03	1.222	1.497	1.268	0.020
Fucose-meto-4TMS	GC/MS	4.33.E-03	3.02.E-03	3.09.E-03	4.47.E-03	2.18.E-03	2.61.E-03	0.968	1.387	1.182	0.306
2-Aminoadipic acid-3TMS	GC/MS	9.03.E-03	9.34.E-03	7.88.E-03	6.70.E-03	6.91.E-03	6.35.E-03	1.348	1.353	1.241	0.018
2-Deoxy-glucose-4TMS	GC/MS	6.89.E-03	8.82.E-03	1.02.E-02	2.01.E-03	4.40.E-03	7.06.E-03	3.436	2.002	1.440	0.016
Putrescine-4TMS	GC/MS	1.79.E-02	1.96.E-02	1.77.E-02	1.52.E-02	1.34.E-02	1.47.E-02	1.177	1.465	1.207	0.071
Aconitic acid-3TMS	GC/MS	1.23.E-03	1.31.E-03	1.53.E-03	1.39.E-03	2.18.E-03	2.34.E-03	0.885	0.599	0.656	0.114
Glutamine-3TMS	GC/MS	2.97.E+00	3.10.E+00	3.00.E+00	2.60.E+00	2.66.E+00	2.74.E+00	1.140	1.163	1.097	0.018
Isocitric acid-4TMS	GC/MS	5.28.E-03	4.84.E-03	5.51.E-03	1.86.E-02	1.77.E-02	1.91.E-02	0.283	0.274	0.289	0.000
2-Aminopimelic acid-3TMS	GC/MS	1.27.E-01	1.00.E-01	1.12.E-01	3.50.E-01	2.78.E-01	2.95.E-01	0.363	0.359	0.379	0.005
Citric acid-4TMS	GC/MS	1.81.E-01	1.39.E-01	1.54.E-01	4.98.E-01	3.98.E-01	4.24.E-01	0.363	0.349	0.363	0.004
Ornithine-4TMS	GC/MS	3.31.E+00	3.75.E+00	3.54.E+00	1.57.E+00	2.00.E+00	1.66.E+00	2.114	1.874	2.140	0.001
Psicose-meto-5TMS	GC/MS	6.20.E-03	5.14.E-03	2.26.E-02	5.63.E-03	3.47.E-03	1.90.E-02	1.102	1.479	1.191	0.160
1,5-Anhydro-glucitol-4TMS	GC/MS	3.46.E-01	5.14.E-01	3.71.E-01	2.65.E-01	2.75.E-01	2.89.E-01	1.306	1.872	1.285	0.125
Sorbose-meto-5TMS	GC/MS	1.41.E-01	2.22.E-01	1.81.E-01	8.53.E-02	9.03.E-02	1.08.E-01	1.656	2.459	1.672	0.063
Fructose-meto-5TMS	GC/MS	5.02.E-02	8.64.E-02	6.93.E-02	1.87.E-02	2.23.E-02	3.10.E-02	2.682	3.879	2.234	0.046
Mannose-meto-5TMS	GC/MS	8.16.E-01	1.32.E+00	7.84.E-01	7.65.E-01	9.15.E-01	6.87.E-01	1.067	1.443	1.141	0.239
5-Dehydroquinic acid-meto-4TMS	GC/MS	2.64.E-02	3.83.E-02	2.89.E-02	2.48.E-02	2.50.E-02	2.75.E-02	1.067	1.534	1.051	0.300
Glucose-meto-5TMS	GC/MS	4.10.E+00	5.49.E+00	4.30.E+00	3.72.E+00	3.62.E+00	4.05.E+00	1.105	1.517	1.061	0.249
Hippuric acid-TMS	GC/MS	3.03.E-02	4.37.E-02	3.58.E-02	3.75.E-02	3.46.E-02	3.96.E-02	0.810	1.261	0.903	0.909
Galactose-meto-5TMS	GC/MS	3.98.E+00	5.45.E+00	4.39.E+00	3.73.E+00	3.71.E+00	3.96.E+00	1.066	1.466	1.107	0.229
Glucosamine-5TMS	GC/MS	9.54.E-02	1.32.E-01	1.06.E-01	9.02.E-02	8.78.E-02	9.41.E-02	1.058	1.506	1.121	0.236
Sebacic acid-2TMS	GC/MS	1.34.E-03	1.24.E-03	1.10.E-03	7.96.E-04	7.58.E-04	8.82.E-04	1.688	1.639	1.242	0.056
Lysine-4TMS	GC/MS	3.75.E-01	4.99.E-01	3.06.E-01	2.95.E-01	3.38.E-01	2.39.E-01	1.272	1.474	1.278	0.073
Glucuronic acid-meto-5TMS	GC/MS	4.35.E-02	4.83.E-02	4.01.E-02	3.16.E-02	2.86.E-02	2.96.E-02	1.379	1.687	1.353	0.039
Histidine-3TMS	GC/MS	4.32.E-01	4.88.E-01	4.59.E-01	3.27.E-01	3.15.E-01	3.63.E-01	1.320	1.548	1.264	0.036
Ascorbic acid-4TMS	GC/MS	8.45.E-03	1.21.E-02	9.87.E-03	7.59.E-03	8.63.E-03	9.09.E-03	1.114	1.400	1.086	0.192
Tyrosine-3TMS	GC/MS	3.54.E-01	4.80.E-01	3.65.E-01	2.98.E-01	3.13.E-01	2.96.E-01	1.187	1.536	1.233	0.110
Galacturonic acid-meto-5TMS	GC/MS	1.66.E-02	2.35.E-02	1.90.E-02	1.56.E-02	1.57.E-02	1.81.E-02	1.065	1.496	1.048	0.293
1-Hexadecanol-TMS	GC/MS	4.27.E-03	8.92.E-03	4.44.E-03	3.79.E-03	5.05.E-03	3.93.E-03	1.124	1.767	1.131	0.287
N-Acetyl-Ornithine-4TMS	GC/MS	2.32.E-02	5.25.E-02	3.03.E-02	2.37.E-02	3.39.E-02	2.86.E-02	0.979	1.550	1.061	0.388
Gluconic acid-6TMS	GC/MS	2.01.E-02	2.17.E-02	1.51.E-02	1.68.E-02	1.49.E-02	1.13.E-02	1.195	1.453	1.337	0.051
Glucaric acid-6TMS	GC/MS	4.06.E-03	2.51.E-03	3.32.E-03	8.22.E-03	6.48.E-03	7.70.E-03	0.494	0.387	0.432	0.001
ParaXanthine-TMS	GC/MS	2.56.E-02	3.28.E-01	1.18.E-01	2.31.E-02	2.09.E-01	1.01.E-01	1.107	1.568	1.162	0.338
Palmitoleic acid-TMS	GC/MS	2.18.E-02	1.11.E-02	3.28.E-02	1.71.E-02	6.58.E-03	2.66.E-02	1.275	1.691	1.236	0.011
Inositol-6TMS	GC/MS	7.29.E-02	1.14.E-01	9.22.E-02	5.43.E-02	6.87.E-02	7.15.E-02	1.344	1.652	1.290	0.079
Uric acid-4TMS	GC/MS	2.53.E+00	4.77.E+00	2.59.E+00	2.29.E+00	3.21.E+00	2.27.E+00	1.105	1.487	1.140	0.240
Citrulline-3TMS	GC/MS	3.97.E-03	4.13.E-03	3.93.E-03	2.26.E-03	2.45.E-03	2.39.E-03	1.755	1.690	1.648	0.001
Margaric acid-TMS	GC/MS	3.03.E-02	2.68.E-02	2.37.E-02	2.52.E-02	1.67.E-02	2.16.E-02	1.204	1.602	1.098	0.131
Kynurenine-3TMS	GC/MS	3.94.E-03	5.64.E-03	4.41.E-03	2.41.E-03	4.20.E-03	2.83.E-03	1.639	1.341	1.556	0.001
Cystamine-4TMS	GC/MS	3.23.E-03	2.24.E-03	3.42.E-03	1.76.E-03	1.28.E-03	2.75.E-03	1.830	1.743	1.244	0.047
Tryptophan-3TMS	GC/MS	4.96.E+00	6.22.E+00	4.42.E+00	3.22.E+00	3.65.E+00	2.93.E+00	1.542	1.705	1.506	0.028
Elaidic acid-TMS	GC/MS	1.22.E-01	8.76.E-02	1.56.E-01	1.07.E-01	5.57.E-02	1.22.E-01	1.143	1.574	1.278	0.045
Stearic acid-TMS	GC/MS	1.87.E+00	1.86.E+00	1.84.E+00	1.68.E+00	1.15.E+00	1.63.E+00	1.116	1.624	1.129	0.161
Cystine-4TMS	GC/MS	2.95.E-02	3.72.E-02	2.78.E-02	9.77.E-03	3.60.E-02	9.98.E-03	3.021	1.032	2.781	0.160
Sucrose-8TMS	GC/MS	1.16.E-02	1.23.E-02	2.54.E-02	7.43.E-03	8.73.E-03	3.61.E-02	1.560	1.410	0.703	0.857
Maltose-meto-8TMS	GC/MS	4.40.E-03	3.09.E-03	7.12.E-03	1.78.E-03	1.62.E-03	4.85.E-03	2.477	1.907	1.469	0.025
Betaine	LC/MS_Cation	3.66.E+00	4.67.E+00	1.14.E+01	3.40.E+00	2.87.E+00	3.67.E+00	1.076	1.624	3.117	0.289
Carnitine	LC/MS_Cation	1.30.E+01	1.68.E+01	3.11.E+01	1.26.E+01	8.63.E+00	7.81.E+00	1.031	1.951	3.986	0.255
Choline	LC/MS_Cation	6.36.E-01	8.16.E-01	1.55.E+00	4.34.E-01	3.15.E-01	2.47.E-01	1.466	2.593	6.256	0.178
Creatine	LC/MS_Cation	8.88.E+00	1.14.E+01	1.99.E+01	8.15.E+00	6.44.E+00	4.81.E+00	1.090	1.768	4.134	0.245
Creatinine	LC/MS_Cation	6.04.E+00	8.04.E+00	1.81.E+01	7.47.E+00	2.84.E+00	3.68.E+00	0.808	2.833	4.921	0.318
Glycine	LC/MS_Cation	3.67.E+00	3.55.E+00	1.11.E+01	3.99.E+00	9.87.E-01	1.97.E+00	0.918	3.598	5.665	0.309
Guanosine	LC/MS_Cation	2.49.E+00	1.16.E+00	3.21.E+00	N.D.	N.D.	N.A.	N.A.	N.A.	N.A.	N.A.
4-Hydroxy-L-proline	LC/MS_Cation	1.98.E+00	3.24.E+00	3.56.E+00	2.09.E+00	1.52.E+00	8.40.E-01	0.946	2.133	4.238	0.224
Hypoxanthine	LC/MS_Cation	6.18.E-01	4.66.E-01	1.15.E+00	5.39.E-02	7.06.E-03	8.83.E-03	11.470	65.975	130.319	0.077
L-Alanine; Sarcosine	LC/MS_Cation	8.57.E+00	9.09.E+00	2.68.E+01	8.11.E+00	3.06.E+00	5.09.E+00	1.057	2.970	5.264	0.278
L-Arginine	LC/MS_Cation	9.16.E+00	1.83.E+01	2.59.E+01	8.31.E+00	9.38.E+00	7.45.E+00	1.102	1.952	3.477	0.206
L-Aspartate	LC/MS_Cation	6.50.E-01	1.04.E+00	1.54.E+00	2.87.E-01	1.36.E-01	9.43.E-02	2.263	7.666	16.317	0.102
L-Asparagine	LC/MS_Cation	5.23.E+00	6.85.E+00	1.48.E+01	4.44.E+00	2.63.E+00	2.86.E+00	1.179	2.600	5.162	0.228

L-Citrulline	LC/MS Cation	1.57.E+00	1.46.E+00	3.59.E+00	1.12.E+00	8.41.E-01	9.37.E-01	1.406	1.738	3.829	0.221
L-Cysteine	LC/MS Cation	4.54.E-01	7.00.E-01	1.00.E+00	3.82.E-01	2.33.E-01	2.31.E-01	1.187	2.999	4.339	0.164
L-Lysine	LC/MS Cation	4.23.E+00	7.75.E+00	7.79.E+00	3.97.E+00	3.73.E+00	1.93.E+00	1.065	2.077	4.039	0.177
L-Glutamine	LC/MS Cation	1.69.E+02	2.09.E+02	3.99.E+02	1.38.E+02	1.04.E+02	9.46.E+01	1.228	2.007	4.217	0.213
L-Glutamate	LC/MS Cation	8.20.E+00	1.00.E+01	2.21.E+01	5.63.E+00	3.91.E+00	4.35.E+00	1.458	2.571	5.083	0.194
L-Histidine	LC/MS Cation	5.03.E+00	7.22.E+00	1.23.E+01	4.41.E+00	4.42.E+00	3.71.E+00	1.142	1.633	3.323	0.234
L-Homoserine; D-Homoserine	LC/MS Cation	5.64.E+00	8.65.E+00	1.78.E+01	5.22.E+00	3.37.E+00	3.75.E+00	1.081	2.567	4.744	0.240
L-Isoleucine	LC/MS Cation	3.02.E+01	3.72.E+01	7.32.E+01	3.25.E+01	1.58.E+01	1.47.E+01	0.929	2.349	4.993	0.281
L-Leucine	LC/MS Cation	5.47.E+01	6.28.E+01	1.21.E+02	5.56.E+01	2.52.E+01	2.31.E+01	0.984	2.494	5.251	0.259
L-Methionine	LC/MS Cation	4.34.E+00	5.87.E+00	1.09.E+01	4.54.E+00	3.29.E+00	2.83.E+00	0.956	1.784	3.859	0.288
L-Ornithine	LC/MS Cation	1.12.E+00	1.71.E+00	3.45.E+00	5.57.E-01	5.85.E-01	3.85.E-01	2.014	2.925	8.961	0.171
L-Phenylalanine	LC/MS Cation	1.50.E+01	2.01.E+01	3.41.E+01	1.41.E+01	1.00.E+01	8.18.E+00	1.070	2.000	4.167	0.233
L-Proline	LC/MS Cation	5.92.E+00	9.44.E+00	1.30.E+01	5.54.E+00	3.95.E+00	2.49.E+00	1.067	2.387	5.234	0.204
L-Serine	LC/MS Cation	9.25.E+00	1.05.E+01	2.06.E+01	8.95.E+00	3.73.E+00	3.83.E+00	1.033	2.807	5.377	0.240
L-Threonine	LC/MS Cation	4.56.E+00	7.05.E+00	1.53.E+01	4.28.E+00	2.56.E+00	2.94.E+00	1.065	2.748	5.188	0.248
L-Tryptophan	LC/MS Cation	3.79.E+00	4.65.E+00	9.05.E+00	3.50.E+00	1.95.E+00	2.01.E+00	1.082	2.380	4.498	0.233
L-Tyrosine	LC/MS Cation	1.08.E+01	1.76.E+01	2.52.E+01	9.37.E+00	1.06.E+01	6.90.E+00	1.154	1.662	3.656	0.214
L-Valine	LC/MS Cation	5.07.E+01	6.63.E+01	1.28.E+02	5.68.E+01	2.81.E+01	2.73.E+01	0.894	2.358	4.714	0.289
DMG	LC/MS Cation	8.82.E-02	1.26.E-01	1.84.E-01	1.88.E-01	7.52.E-02	6.96.E-02	0.470	1.673	2.645	0.763
Uridine	LC/MS Cation	1.33.E+00	2.60.E+00	2.32.E+00	8.21.E-01	1.50.E+00	4.94.E-01	1.619	1.732	4.694	0.095
L-Cystathionine	LC/MS Cation	3.27.E-02	3.01.E-02	4.46.E-02	3.31.E-02	1.19.E-02	1.63.E-02	0.990	2.530	2.733	0.208
L-Cystine	LC/MS Cation	3.87.E+01	7.95.E+01	9.41.E+01	2.52.E+01	3.63.E+01	1.97.E+01	1.535	2.187	4.786	0.131
N-Acetylglycine	LC/MS Cation	8.85.E-02	1.34.E-01	3.64.E-01	1.54.E-01	4.08.E-02	4.53.E-02	0.576	3.279	8.018	0.409
L-Pyroglutamic acid	LC/MS Cation	3.42.E+00	5.38.E+00	1.34.E+01	3.29.E+00	2.03.E+00	2.58.E+00	1.040	2.647	5.201	0.272
S-Methyl-L-cysteine	LC/MS Cation	1.15.E-01	1.20.E-01	7.37.E-01	1.24.E-01	6.76.E-02	8.10.E-02	0.933	1.782	9.101	0.386
N-Acetyl-DL-alanine	LC/MS Cation	2.03.E-01	3.78.E-01	1.05.E+00	2.76.E-01	1.31.E-01	1.30.E-01	0.734	2.899	8.056	0.339
L-Kynurenine	LC/MS Cation	1.81.E-01	4.08.E-01	3.55.E-01	2.39.E-01	2.07.E-01	1.44.E-01	0.759	1.971	2.455	0.311
Phosphocholine	LC/MS Cation	8.99.E-02	7.91.E-02	3.64.E-01	7.71.E-02	1.08.E-01	8.64.E-02	1.166	0.735	4.217	0.459
Acetyl-L-glutamine	LC/MS Cation	7.39.E-01	1.13.E+00	1.99.E+00	8.89.E-01	7.95.E-01	6.52.E-01	0.831	1.421	3.052	0.367
L-2-Aminobutyric acid	LC/MS Cation	3.25.E-01	3.15.E-01	5.46.E-01	4.01.E-01	2.64.E-01	2.63.E-01	0.810	1.190	2.079	0.501
Uric Acid	LC/MS Cation	1.38.E+00	2.76.E+00	3.40.E+00	1.35.E+00	1.55.E+00	9.08.E-01	1.026	1.778	3.741	0.221
Glycolic acid	LC/MS Anion	3.13.E-03	3.48.E-03	2.51.E-03	4.20.E-03	1.69.E-03	4.07.E-03	0.746	2.064	0.617	0.816
Lactic acid	LC/MS Anion	6.47.E-01	5.65.E-01	6.81.E-01	3.77.E-01	2.85.E-01	4.45.E-01	1.713	1.980	1.532	0.002
Benzoic acid	LC/MS Anion	2.14.E-02	2.31.E-02	1.66.E-02	2.58.E-02	1.82.E-02	2.36.E-02	0.830	1.271	0.702	0.612
Ethyl-malonic acid	LC/MS Anion	7.96.E-02	8.35.E-02	1.65.E-01	7.94.E-02	9.27.E-02	1.79.E-01	1.004	0.900	0.921	0.210
o-Toluic acid	LC/MS Anion	3.10.E-03	1.54.E-03	1.75.E-03	1.75.E-03	6.05.E-04	1.84.E-03	1.772	2.542	0.956	0.226
2-Hydroxy-phenylacetic acid	LC/MS Anion	7.47.E-03	7.62.E-03	7.61.E-03	6.61.E-03	5.66.E-03	9.31.E-03	1.130	1.347	0.817	0.764
3-Hydroxy-3-methyl-glutaric acid	LC/MS Anion	5.42.E-03	2.67.E-03	3.99.E-03	4.90.E-03	6.36.E-03	7.15.E-03	1.108	0.420	0.558	0.253
Uric acid	LC/MS Anion	1.09.E-01	1.55.E-01	1.27.E-01	1.17.E-01	1.32.E-01	9.98.E-02	0.928	1.172	1.270	0.342
Glucuronic acid	LC/MS Anion	1.45.E-02	1.79.E-02	1.28.E-02	1.98.E-02	1.43.E-02	1.98.E-02	0.731	1.252	0.644	0.469
N-Acetyl-neuraminic acid	LC/MS Anion	4.54.E-03	3.05.E-03	5.34.E-03	7.25.E-03	4.13.E-03	4.81.E-03	0.626	0.739	1.110	0.366
Pyruvic acid	LC/MS Anion	9.42.E-03	1.66.E-02	3.36.E-02	2.72.E-02	2.37.E-02	4.27.E-02	0.347	0.700	0.786	0.074
Oxalic acid	LC/MS Anion	3.00.E-03	4.31.E-03	4.66.E-03	3.63.E-02	3.19.E-02	3.99.E-02	0.083	0.135	0.117	0.005
Fumaric acid	LC/MS Anion	3.00.E-02	3.33.E-02	3.74.E-02	3.21.E-02	3.19.E-02	3.13.E-02	0.932	1.046	1.196	0.529
3-Hydroxy-3-methyl-butanoic acid (3-Hydroxyisovaleric acid)	LC/MS Anion	3.97.E-02	6.39.E-02	5.01.E-02	4.09.E-02	5.82.E-02	4.16.E-02	0.970	1.099	1.204	0.273
4-Methyl-2-oxovaleric acid	LC/MS Anion	1.12.E-01	1.18.E-01	1.04.E-01	1.31.E-01	1.14.E-01	1.12.E-01	0.857	1.039	0.927	0.379
2-Hydroxy-isocaproic acid	LC/MS Anion	4.45.E-02	4.77.E-02	5.64.E-02	4.51.E-02	3.67.E-02	5.31.E-02	0.985	1.298	1.063	0.313
2-Hydroxy-glutaric acid	LC/MS Anion	4.44.E-03	5.36.E-03	8.73.E-03	6.21.E-03	8.13.E-03	1.12.E-02	0.715	0.660	0.778	0.016
4-Hydroxy-phenyl-lactic acid	LC/MS Anion	9.36.E-03	9.71.E-03	2.00.E-02	8.65.E-03	4.61.E-03	1.26.E-02	1.082	2.108	1.586	0.154
Isocitric acid	LC/MS Anion	2.62.E-03	3.36.E-03	3.45.E-03	4.87.E-02	4.22.E-02	4.91.E-02	0.054	0.080	0.070	0.003
Phosphoric acid	LC/MS Anion	2.32.E-01	1.65.E-01	1.61.E-01	6.81.E-01	5.38.E-01	5.76.E-01	0.341	0.307	0.279	0.003
Malic acid	LC/MS Anion	1.38.E-02	1.35.E-02	2.88.E-02	9.29.E-02	4.60.E-02	6.91.E-02	0.148	0.293	0.417	0.072
β-Phenyl-lactic acid	LC/MS Anion	7.62.E-03	6.39.E-03	1.28.E-02	8.21.E-03	9.75.E-03	1.39.E-02	0.929	0.655	0.921	0.188
Hippuric acid	LC/MS Anion	6.27.E-03	1.73.E-02	5.91.E-03	8.93.E-03	1.46.E-02	5.36.E-03	0.702	1.181	1.102	0.918
Citric acid	LC/MS Anion	1.11.E-01	7.67.E-02	1.10.E-01	2.59.E+00	2.35.E+00	2.59.E+00	0.043	0.033	0.043	0.001
2-Hydroxy-hippuric acid	LC/MS Anion	7.53.E-04	7.51.E-04	5.22.E-03	2.91.E-03	2.87.E-03	4.58.E-03	0.259	0.262	1.140	0.321
3-Hydroxy-propionic acid	LC/MS Anion	6.29.E-03	4.29.E-03	4.66.E-03	4.75.E-03	4.24.E-03	4.79.E-03	1.322	1.012	0.974	0.452
3-Hydroxy-isobutyric acid	LC/MS Anion	6.32.E-02	9.16.E-02	8.26.E-02	7.12.E-02	8.37.E-02	6.93.E-02	0.888	1.095	1.191	0.563
Glyceric acid	LC/MS Anion	6.31.E-02	4.97.E-02	5.65.E-02	8.67.E-02	7.96.E-02	8.01.E-02	0.728	0.625	0.706	0.007
Succinic acid	LC/MS Anion	2.81.E-01	2.82.E-01	3.57.E-01	2.51.E-01	2.02.E-01	2.55.E-01	1.121	1.395	1.402	0.079
2-Hydroxy-3-methyl-butyric acid (2-Hydroxyisovaleric acid)	LC/MS Anion	2.84.E-01	4.21.E-01	4.95.E-01	2.70.E-01	3.26.E-01	4.27.E-01	1.052	1.294	1.158	0.133

Glutaric acid	LC/MS Anion	2.65.E-02	3.41.E-02	2.59.E-02	2.29.E-02	3.28.E-02	2.18.E-02	1.159	1.038	1.190	0.077
Threonic acid	LC/MS Anion	1.08.E+00	9.85.E-01	1.16.E+00	7.84.E-01	6.63.E-01	8.88.E-01	1.374	1.486	1.311	0.002
Acetyl-salicylic acid	LC/MS Anion	1.20.E-02	1.64.E-02	2.76.E-02	8.43.E-03	1.50.E-02	2.18.E-02	1.420	1.096	1.267	0.104
2-Ketoglutaric acid	LC/MS Anion	5.78.E-02	4.94.E-02	7.71.E-02	1.12.E-01	1.02.E-01	1.40.E-01	0.514	0.485	0.551	0.003
cis-Aconitic acid	LC/MS Anion	1.32.E-01	1.24.E-01	1.30.E-01	2.26.E-01	1.84.E-01	2.37.E-01	0.585	0.677	0.547	0.026
Quinic acid	LC/MS Anion	3.46.E-03	3.91.E-02	7.05.E-03	6.70.E-03	3.51.E-02	2.84.E-03	0.517	1.114	2.479	0.568
Gluconic acid	LC/MS Anion	7.62.E-02	6.89.E-02	5.98.E-02	7.95.E-02	7.08.E-02	6.18.E-02	0.958	0.973	0.967	0.034
LPC 14:0 (sn-1)	LC/MS Lipid	4.90.E-02	1.05.E-01	1.14.E-01	4.26.E-02	1.12.E-01	1.16.E-01	1.150	0.942	0.980	0.849
LPC 14:0 (sn-2)	LC/MS Lipid	1.26.E-01	2.75.E-01	2.77.E-01	1.19.E-01	2.81.E-01	2.81.E-01	1.059	0.982	0.986	0.865
LPC 16:0p	LC/MS Lipid	2.44.E-02	1.83.E-02	2.70.E-02	2.38.E-02	1.74.E-02	2.72.E-02	1.025	1.049	0.991	0.360
LPC 15:0 (sn-1)	LC/MS Lipid	5.43.E-02	6.10.E-02	3.89.E-02	4.74.E-02	6.07.E-02	5.03.E-02	1.146	1.005	0.772	0.816
LPC 15:0 (sn-2)	LC/MS Lipid	1.14.E-01	1.19.E-01	9.04.E-02	1.03.E-01	1.31.E-01	9.69.E-02	1.109	0.911	0.933	0.767
LPC 16:0e	LC/MS Lipid	2.15.E-02	1.41.E-02	2.00.E-02	2.32.E-02	1.65.E-02	1.90.E-02	0.928	0.851	1.055	0.434
LPC 16:1 (sn-1)	LC/MS Lipid	1.46.E-01	2.12.E-01	3.14.E-01	1.22.E-01	2.11.E-01	3.55.E-01	1.199	1.003	0.886	0.809
LPC 16:1 (sn-2)	LC/MS Lipid	3.59.E-01	5.23.E-01	8.11.E-01	3.61.E-01	5.16.E-01	8.79.E-01	0.996	1.013	0.922	0.470
LPC 16:0 (sn-1)	LC/MS Lipid	9.23.E+00	1.20.E+01	1.28.E+01	8.66.E+00	1.22.E+01	1.43.E+01	1.066	0.980	0.898	0.588
LPC 16:0 (sn-2)	LC/MS Lipid	2.02.E+01	2.50.E+01	2.80.E+01	1.93.E+01	2.47.E+01	2.85.E+01	1.048	1.012	0.981	0.641
LPC 17:1 (sn-1)	LC/MS Lipid	2.28.E-02	2.72.E-02	3.54.E-02	2.02.E-02	2.34.E-02	3.22.E-02	1.127	1.163	1.100	0.012
LPC 17:1 (sn-2)	LC/MS Lipid	4.34.E-02	4.50.E-02	7.04.E-02	4.74.E-02	4.99.E-02	7.33.E-02	0.916	0.903	0.961	0.021
LPC 17:0 (sn-1)	LC/MS Lipid	1.91.E-01	1.76.E-01	1.49.E-01	2.25.E-01	1.55.E-01	1.60.E-01	0.848	1.136	0.932	0.667
LPC 17:0 (sn-2)	LC/MS Lipid	2.37.E-01	1.99.E-01	1.95.E-01	2.45.E-01	2.05.E-01	2.08.E-01	0.966	0.971	0.939	0.045
LPC 18:3 (sn-1)	LC/MS Lipid	2.95.E-02	3.90.E-02	9.24.E-02	2.46.E-02	4.36.E-02	9.76.E-02	1.201	0.894	0.946	0.668
LPC 18:3 (sn-2)	LC/MS Lipid	4.62.E-02	4.94.E-02	1.38.E-01	3.77.E-02	5.30.E-02	1.64.E-01	1.223	0.931	0.845	0.559
LPC 18:2 (sn-1)	LC/MS Lipid	5.06.E+00	5.03.E+00	6.73.E+00	4.69.E+00	5.60.E+00	8.10.E+00	1.079	0.899	0.832	0.408
LPC 18:2 (sn-2)	LC/MS Lipid	7.92.E+00	7.31.E+00	1.17.E+01	7.81.E+00	8.10.E+00	1.31.E+01	1.014	0.903	0.897	0.251
LPC 18:1 (sn-1)	LC/MS Lipid	2.60.E+00	2.60.E+00	4.44.E+00	2.49.E+00	2.57.E+00	4.56.E+00	1.044	1.013	0.975	0.900
LPC 18:1 (sn-2)	LC/MS Lipid	4.48.E+00	4.32.E+00	8.00.E+00	4.70.E+00	4.67.E+00	8.95.E+00	0.953	0.926	0.893	0.155
LPC 18:0 (sn-1)	LC/MS Lipid	3.71.E+00	3.19.E+00	3.83.E+00	3.47.E+00	3.13.E+00	4.06.E+00	1.071	1.019	0.943	0.878
LPC 18:0 (sn-2)	LC/MS Lipid	7.29.E+00	6.48.E+00	7.78.E+00	7.17.E+00	6.51.E+00	8.15.E+00	1.017	0.996	0.955	0.594
LPC 19:0 (sn-1)	LC/MS Lipid	1.54.E-02	1.65.E-02	1.59.E-02	1.46.E-02	1.65.E-02	2.13.E-02	1.054	1.003	0.743	0.516
LPC 19:0 (sn-2)	LC/MS Lipid	2.40.E-02	2.00.E-02	2.64.E-02	2.19.E-02	1.99.E-02	2.52.E-02	1.093	1.004	1.045	0.195
LPC 20:5 (sn-1)	LC/MS Lipid	6.70.E-02	1.82.E-01	1.71.E-01	6.14.E-02	1.88.E-01	2.01.E-01	1.091	0.967	0.847	0.431
LPC 20:5 (sn-2)	LC/MS Lipid	9.17.E-02	2.30.E-01	2.63.E-01	7.31.E-02	2.22.E-01	3.02.E-01	1.255	1.039	0.871	0.846
LPC 20:4 (sn-1)	LC/MS Lipid	7.18.E-01	1.02.E+00	1.10.E+00	6.30.E-01	1.07.E+00	1.29.E+00	1.140	0.948	0.853	0.583
LPC 20:4 (sn-2)	LC/MS Lipid	9.27.E-01	1.18.E+00	1.58.E+00	8.54.E-01	1.21.E+00	1.67.E+00	1.086	0.979	0.950	0.820
LPC 20:3 (sn-1)	LC/MS Lipid	2.48.E-01	2.56.E-01	3.08.E-01	2.29.E-01	2.71.E-01	3.49.E-01	1.081	0.943	0.882	0.541
LPC 20:3 (sn-2)	LC/MS Lipid	2.62.E-01	2.93.E-01	4.28.E-01	2.44.E-01	2.71.E-01	4.57.E-01	1.073	1.080	0.936	0.855
LPC 20:2 (sn-1)	LC/MS Lipid	3.65.E-02	4.06.E-02	4.64.E-02	3.64.E-02	3.99.E-02	6.10.E-02	1.003	1.016	0.761	0.453
LPC 20:2 (sn-2)	LC/MS Lipid	5.20.E-02	4.61.E-02	7.71.E-02	4.71.E-02	4.54.E-02	8.39.E-02	1.104	1.015	0.918	0.913
LPC 20:1 (sn-1)	LC/MS Lipid	3.57.E-02	3.09.E-02	5.40.E-02	3.14.E-02	2.79.E-02	5.95.E-02	1.136	1.105	0.907	0.870
LPC 20:1 (sn-2)	LC/MS Lipid	5.76.E-02	4.61.E-02	9.45.E-02	5.40.E-02	4.73.E-02	1.13.E-01	1.066	0.975	0.834	0.506
LPC 20:0 (sn-1)	LC/MS Lipid	2.59.E-02	1.52.E-02	2.49.E-02	1.89.E-02	1.76.E-02	3.00.E-02	1.371	0.860	0.830	0.963
LPC 20:0 (sn-2)	LC/MS Lipid	4.12.E-02	3.11.E-02	4.94.E-02	4.26.E-02	3.40.E-02	5.02.E-02	0.966	0.915	0.983	0.107
LPC 22:6 (sn-1)	LC/MS Lipid	2.60.E-01	4.03.E-01	4.06.E-01	2.30.E-01	4.30.E-01	5.08.E-01	1.129	0.938	0.801	0.479
LPC 22:6 (sn-2)	LC/MS Lipid	3.04.E-01	4.03.E-01	5.51.E-01	2.61.E-01	4.23.E-01	5.83.E-01	1.164	0.951	0.946	0.907
LPC 22:4 (sn-1)	LC/MS Lipid	1.39.E-02	1.67.E-02	1.72.E-02	9.76.E-03	1.93.E-02	2.23.E-02	1.420	0.863	0.773	0.703
LPC 22:4 (sn-2)	LC/MS Lipid	1.27.E-02	1.64.E-02	1.83.E-02	1.09.E-02	1.49.E-02	2.17.E-02	1.160	1.106	0.843	0.987
LPC 22:0 (sn-1)	LC/MS Lipid	5.88.E-03	3.56.E-03	6.36.E-03	5.75.E-03	4.40.E-03	5.38.E-03	1.022	0.810	1.182	0.879
LPC 22:0 (sn-2)	LC/MS Lipid	1.14.E-02	8.04.E-03	9.87.E-03	9.19.E-03	7.88.E-03	1.30.E-02	1.242	1.020	0.757	0.882
PC 14:0-16:1	LC/MS Lipid	3.90.E+01	3.11.E+01	3.20.E+01	3.49.E+01	3.01.E+01	3.04.E+01	1.117	1.033	1.052	0.146
PC 16:0-14:0	LC/MS Lipid	2.15.E+00	2.93.E+00	3.27.E+00	1.94.E+00	2.96.E+00	3.25.E+00	1.109	0.991	1.005	0.458
PC 15:0-16:1	LC/MS Lipid	8.25.E-02	1.26.E-01	1.01.E-01	7.19.E-02	1.33.E-01	1.18.E-01	1.148	0.948	0.856	0.640
PC 16:0p-16:0	LC/MS Lipid	9.28.E-01	6.85.E-01	7.81.E-01	8.04.E-01	6.62.E-01	8.16.E-01	1.154	1.034	0.957	0.507
PC 16:0-15:0	LC/MS Lipid	2.41.E-01	3.32.E-01	1.56.E-01	2.25.E-01	3.27.E-01	1.68.E-01	1.069	1.014	0.928	0.772
PC 16:0e-16:0	LC/MS Lipid	1.78.E+00	1.46.E+00	1.84.E+00	1.60.E+00	1.42.E+00	1.85.E+00	1.114	1.028	0.996	0.338
PC 14:0-18:2/16:1-16:1	LC/MS Lipid	3.37.E+00	4.96.E+00	4.73.E+00	2.87.E+00	4.92.E+00	5.07.E+00	1.175	1.008	0.933	0.812
PC 14:0-18:1/16:0-16:1	LC/MS Lipid	1.18.E+01	2.01.E+01	2.46.E+01	1.03.E+01	1.94.E+01	2.57.E+01	1.148	1.039	0.959	0.644
PC 16:0-16:0	LC/MS Lipid	7.94.E+00	9.76.E+00	1.03.E+01	7.18.E+00	1.02.E+01	1.05.E+01	1.106	0.957	0.986	0.887
PC 15:0-18:2	LC/MS Lipid	2.56.E+00	2.50.E+00	1.51.E+00	2.26.E+00	2.56.E+00	1.59.E+00	1.131	0.978	0.954	0.690
PC 16:0e-18:2	LC/MS Lipid	4.75.E+00	4.64.E+00	4.09.E+00	4.17.E+00	4.74.E+00	4.27.E+00	1.139	0.980	0.958	0.710
PC 16:1e-18:1	LC/MS Lipid	2.46.E+00	2.54.E+00	3.34.E+00	2.16.E+00	2.61.E+00	3.45.E+00	1.142	0.975	0.969	0.767
PC 15:0-18:1/16:0-17:1	LC/MS Lipid	9.43.E-01	1.36.E+00	1.08.E+00	8.89.E-01	1.38.E+00	1.06.E+00	1.060	0.986	1.019	0.477

PC 18:1e-16:0/18:0e-16:1	LC/MS Lipid	8.04.E+00	7.53.E+00	8.76.E+00	6.96.E+00	7.48.E+00	9.14.E+00	1.155	1.006	0.958	0.626
PC 17:0-16:0/18:0-15:0	LC/MS Lipid	7.47.E-01	7.10.E-01	8.05.E-01	6.32.E-01	7.08.E-01	8.18.E-01	1.181	1.003	0.984	0.478
PC 18:0e-16:0	LC/MS Lipid	8.43.E-01	5.72.E-01	5.00.E-01	7.54.E-01	5.78.E-01	5.10.E-01	1.118	0.991	0.981	0.522
PC 14:0-20:5	LC/MS Lipid	6.65.E-02	2.60.E-01	2.52.E-01	7.60.E-02	2.91.E-01	2.71.E-01	0.876	0.892	0.931	0.089
PC 16:1-18:3/14:0-20:4	LC/MS Lipid	1.15.E+00	2.50.E+00	2.70.E+00	1.01.E+00	2.32.E+00	2.76.E+00	1.141	1.078	0.979	0.352
PC 14:0-20:3	LC/MS Lipid	1.43.E+01	2.08.E+01	2.51.E+01	1.27.E+01	2.16.E+01	2.59.E+01	1.128	0.967	0.968	0.975
PC 16:1-18:2/16:0-18:3	LC/MS Lipid	1.43.E+01	2.08.E+01	2.51.E+01	1.27.E+01	2.16.E+01	2.59.E+01	1.127	0.964	0.971	0.975
PC 16:0-18:2/16:1-18:1	LC/MS Lipid	1.52.E+02	1.64.E+02	1.50.E+02	1.43.E+02	1.66.E+02	1.55.E+02	1.065	0.989	0.973	0.823
PC 16:0-18:1	LC/MS Lipid	1.17.E+02	1.58.E+02	1.50.E+02	1.09.E+02	1.61.E+02	1.52.E+02	1.078	0.982	0.983	0.816
PC 16:0-18:0	LC/MS Lipid	5.10.E+00	6.53.E+00	5.17.E+00	4.58.E+00	6.61.E+00	5.13.E+00	1.114	0.989	1.007	0.472
PC 15:0-20:5	LC/MS Lipid	1.04.E-01	2.93.E-01	1.58.E-01	9.68.E-02	2.78.E-01	1.59.E-01	1.073	1.055	0.992	0.282
PC 16:0e-20:5	LC/MS Lipid	8.05.E+00	8.55.E+00	8.90.E+00	7.64.E+00	7.66.E+00	8.16.E+00	1.054	1.116	1.091	0.041
PC 16:0p-20:4	LC/MS Lipid	8.05.E+00	8.55.E+00	8.90.E+00	7.64.E+00	7.66.E+00	8.16.E+00	1.054	1.116	1.091	0.041
PC 15:0-20:4	LC/MS Lipid	6.68.E-01	1.02.E+00	6.73.E-01	5.89.E-01	1.05.E+00	6.88.E-01	1.134	0.972	0.978	0.765
PC 16:1e-20:3	LC/MS Lipid	1.18.E+01	1.43.E+01	1.21.E+01	1.09.E+01	1.43.E+01	1.20.E+01	1.085	1.003	1.007	0.345
PC 17:1-18:2	LC/MS Lipid	1.60.E+00	1.68.E+00	1.53.E+00	1.45.E+00	1.61.E+00	1.52.E+00	1.108	1.043	1.002	0.230
PC 18:1e-18:2	LC/MS Lipid	3.17.E+00	2.65.E+00	2.92.E+00	2.98.E+00	2.56.E+00	2.84.E+00	1.062	1.033	1.028	0.076
PC 18:2e-18:1	LC/MS Lipid	3.62.E+00	3.18.E+00	3.89.E+00	3.29.E+00	3.23.E+00	3.91.E+00	1.099	0.984	0.993	0.565
PC 17:1-18:1/17:0-18:2	LC/MS Lipid	8.52.E+00	7.18.E+00	5.03.E+00	8.04.E+00	7.14.E+00	5.13.E+00	1.060	1.007	0.981	0.498
PC 18:0p-18:1/18:1e-18:1	LC/MS Lipid	5.37.E+00	4.27.E+00	4.68.E+00	4.86.E+00	3.92.E+00	4.55.E+00	1.106	1.089	1.028	0.098
PC 16:0e-20:2	LC/MS Lipid	1.10.E+00	7.99.E-01	1.11.E+00	1.00.E+00	6.69.E-01	1.07.E+00	1.096	1.194	1.041	0.070
PC 17:0-18:1/17:1-18:0/16:0-19:1	LC/MS Lipid	3.15.E+00	4.12.E+00	3.10.E+00	2.91.E+00	4.02.E+00	3.12.E+00	1.084	1.025	0.993	0.297
PC 16:1-20:5	LC/MS Lipid	9.16.E-02	3.10.E-01	4.95.E-01	9.51.E-02	2.24.E-01	4.51.E-01	0.964	1.385	1.096	0.247
PC 14:0-22:6	LC/MS Lipid	6.00.E-01	1.26.E+00	1.26.E+00	5.47.E-01	1.14.E+00	1.15.E+00	1.097	1.107	1.096	0.047
PC 18:2-18:3	LC/MS Lipid	2.83.E+00	3.67.E+00	5.85.E+00	2.35.E+00	3.35.E+00	5.76.E+00	1.202	1.096	1.016	0.118
PC 14:0-22:5/16:1-20:4/16:0-20:5	LC/MS Lipid	1.54.E+01	4.54.E+01	3.45.E+01	1.39.E+01	4.47.E+01	3.41.E+01	1.108	1.016	1.011	0.120
PC 18:2-18:2/18:1-18:3	LC/MS Lipid	4.00.E+01	3.73.E+01	4.05.E+01	3.59.E+01	3.58.E+01	4.06.E+01	1.111	1.043	0.997	0.272
PC 16:0-20:4/16:1-20:3	LC/MS Lipid	4.97.E+01	7.19.E+01	6.54.E+01	4.82.E+01	7.14.E+01	6.39.E+01	1.031	1.007	1.023	0.078
PC 18:1-18:2/16:0-20:3/18:0-18:3	LC/MS Lipid	8.38.E+01	9.05.E+01	9.23.E+01	8.06.E+01	8.86.E+01	8.93.E+01	1.039	1.022	1.033	0.019
PC 18:1-18:1/18:0-18:2	LC/MS Lipid	1.63.E+02	1.62.E+02	1.63.E+02	1.55.E+02	1.59.E+02	1.59.E+02	1.050	1.019	1.020	0.095
PC 18:0-18:1	LC/MS Lipid	4.88.E+01	6.27.E+01	6.49.E+01	4.52.E+01	5.98.E+01	6.28.E+01	1.080	1.048	1.033	0.023
PC 16:0p-22:6	LC/MS Lipid	1.44.E+00	2.12.E+00	1.94.E+00	1.32.E+00	2.05.E+00	1.76.E+00	1.088	1.031	1.105	0.073
PC 18:0-18:0	LC/MS Lipid	2.37.E-01	3.20.E-01	2.21.E-01	1.60.E-01	3.70.E-01	1.35.E-01	1.485	0.864	1.635	0.484
PC 15:0-22:6	LC/MS Lipid	4.76.E-01	6.02.E-01	3.19.E-01	4.38.E-01	5.82.E-01	3.51.E-01	1.086	1.035	0.910	0.714
PC 18:1e-20:5	LC/MS Lipid	5.27.E-01	9.20.E-01	6.74.E-01	5.28.E-01	8.16.E-01	6.36.E-01	0.999	1.128	1.061	0.262
PC 16:0e-22:6	LC/MS Lipid	4.61.E+00	5.86.E+00	4.97.E+00	4.35.E+00	5.56.E+00	4.83.E+00	1.059	1.054	1.030	0.038
PC 17:0-20:5/17:1-20:4	LC/MS Lipid	6.83.E-01	1.21.E+00	8.09.E-01	6.42.E-01	1.15.E+00	7.97.E-01	1.063	1.054	1.015	0.119
PC 16:0e-22:5/18:0e-20:5	LC/MS Lipid	8.78.E+00	8.06.E+00	8.12.E+00	8.02.E+00	7.56.E+00	7.86.E+00	1.094	1.066	1.033	0.072
PC 18:0p-20:4	LC/MS Lipid	4.46.E+00	4.46.E+00	3.61.E+00	3.69.E+00	3.98.E+00	3.33.E+00	1.086	1.122	1.083	0.030
PC 17:0-20:4	LC/MS Lipid	2.01.E+00	2.44.E+00	1.45.E+00	1.93.E+00	2.35.E+00	1.46.E+00	1.037	1.041	0.999	0.201
PC 18:1e-20:3	LC/MS Lipid	2.09.E+00	1.97.E+00	1.94.E+00	1.89.E+00	1.78.E+00	1.83.E+00	1.103	1.109	1.059	0.029
PC 18:0e-20:4	LC/MS Lipid	9.87.E+00	8.02.E+00	5.95.E+00	9.12.E+00	7.43.E+00	5.50.E+00	1.082	1.080	1.081	0.021
PC 17:0-20:3/19:1-18:2	LC/MS Lipid	9.48.E-01	9.19.E-01	6.37.E-01	9.24.E-01	8.55.E-01	5.96.E-01	1.026	1.075	1.069	0.066
PC 19:1-18:1/19:0-18:2	LC/MS Lipid	1.83.E+00	1.74.E+00	1.67.E+00	1.68.E+00	1.63.E+00	1.58.E+00	1.088	1.067	1.059	0.020
PC 19:0-18:1/18:0-19:1	LC/MS Lipid	7.43.E-01	8.01.E-01	7.61.E-01	7.12.E-01	7.38.E-01	6.69.E-01	1.043	1.085	1.138	0.073
PC 18:2-20:5/16:1-22:6	LC/MS Lipid	1.90.E+00	4.11.E+00	3.90.E+00	1.73.E+00	4.08.E+00	3.79.E+00	1.098	1.008	1.031	0.121
PC 18:2-20:4/16:0-22:6	LC/MS Lipid	6.12.E+01	7.93.E+01	6.63.E+01	5.84.E+01	7.68.E+01	6.42.E+01	1.049	1.033	1.034	0.007
PC 18:1-20:4	LC/MS Lipid	1.44.E+01	1.52.E+01	1.34.E+01	1.18.E+01	1.48.E+01	1.25.E+01	1.225	1.029	1.071	0.191
PC 18:0-20:5	LC/MS Lipid	8.09.E+00	1.50.E+01	1.31.E+01	8.20.E+00	1.47.E+01	1.31.E+01	0.987	1.019	1.003	0.598
PC 18:1-20:3	LC/MS Lipid	4.72.E+00	4.57.E+00	5.13.E+00	4.54.E+00	4.70.E+00	4.95.E+00	1.040	0.972	1.037	0.543
PC 18:0-20:4	LC/MS Lipid	3.35.E+01	4.48.E+01	3.86.E+01	3.24.E+01	4.36.E+01	3.73.E+01	1.035	1.029	1.034	0.001
PC 18:1-20:2/18:0-20:3	LC/MS Lipid	2.97.E+01	3.28.E+01	3.00.E+01	2.77.E+01	3.09.E+01	2.86.E+01	1.074	1.061	1.051	0.010
PC 16:0-22:2	LC/MS Lipid	3.27.E+00	3.54.E+00	3.12.E+00	2.98.E+00	3.35.E+00	3.00.E+00	1.097	1.058	1.038	0.059
PC 18:0-20:2	LC/MS Lipid	6.16.E+00	6.47.E+00	7.33.E+00	5.71.E+00	5.98.E+00	6.91.E+00	1.080	1.082	1.061	0.002
PC 20:0-18:1	LC/MS Lipid	1.28.E+01	1.12.E+01	1.37.E+01	1.21.E+01	9.92.E+00	1.15.E+01	1.057	1.125	1.191	0.089
PC 18:1e-22:6	LC/MS Lipid	1.76.E+00	1.76.E+00	1.72.E+00	1.64.E+00	1.65.E+00	1.61.E+00	1.042	1.065	1.068	0.019
PC 17:0-22:6	LC/MS Lipid	9.78.E-01	1.06.E+00	7.04.E-01	8.90.E-01	1.02.E+00	6.71.E-01	1.098	1.044	1.050	0.079
PC 18:1e-22:5	LC/MS Lipid	5.65.E-01	3.50.E-01	4.73.E-01	4.75.E-01	4.48.E-01	3.79.E-01	1.190	0.782	1.248	0.694
PC 18:0p-22:5	LC/MS Lipid	2.39.E+00	2.27.E+00	1.56.E+00	2.18.E+00	2.05.E+00	1.45.E+00	1.093	1.109	1.076	0.035
PC 19:0-20:3	LC/MS Lipid	4.68.E-01	3.41.E-01	3.78.E-01	4.32.E-01	3.30.E-01	3.00.E-01	1.084	1.035	1.260	0.163
PC 20:4-20:4	LC/MS Lipid	1.04.E+00	1.60.E+00	1.39.E+00	9.26.E-01	1.51.E+00	1.41.E+00	1.121	1.060	0.980	0.317
PC 20:3-20:4	LC/MS Lipid	5.05.E-01	5.62.E-01	4.79.E-01	4.41.E-01	5.29.E-01	4.67.E-01	1.146	1.062	1.025	0.141

PC 18:1-22:6	LC/MS Lipid	1.22.E+00	1.49.E+00	1.67.E+00	1.22.E+00	1.43.E+00	1.59.E+00	1.004	1.036	1.047	1.167
PC 20:2-20:4/18:1-22:5	LC/MS Lipid	9.36.E-01	1.12.E+00	1.20.E+00	8.92.E-01	1.05.E+00	1.14.E+00	1.049	1.065	1.050	0.016
PC 18:0-22:6	LC/MS Lipid	1.07.E+01	1.44.E+01	1.24.E+01	1.00.E+01	1.39.E+01	1.20.E+01	1.064	1.036	1.037	0.012
PC 18:0-22:5	LC/MS Lipid	4.67.E+00	5.93.E+00	5.30.E+00	4.32.E+00	5.71.E+00	5.15.E+00	1.083	1.038	1.029	0.060
PC 20:1-20:3/18:0-22:4	LC/MS Lipid	2.12.E+00	2.48.E+00	2.05.E+00	1.90.E+00	2.28.E+00	2.03.E+00	1.117	1.087	1.008	0.156
PC 18:1-22:0	LC/MS Lipid	5.21.E-02	5.87.E-02	4.97.E-02	4.54.E-02	5.46.E-02	4.28.E-02	1.147	1.076	1.161	0.021
PC 19:0-22:6	LC/MS Lipid	1.07.E-01	1.40.E-01	1.09.E-01	8.63.E-02	1.13.E-01	1.01.E-01	1.242	1.238	1.080	0.078
LPE 16:0 (sn-1)	LC/MS Lipid	4.85.E-02	4.40.E-02	7.15.E-02	5.24.E-02	4.96.E-02	8.49.E-02	0.926	0.886	0.842	0.121
LPE 16:0 (sn-2)	LC/MS Lipid	7.47.E-02	5.98.E-02	1.00.E-01	7.96.E-02	7.33.E-02	1.08.E-01	0.938	0.815	0.925	0.072
LPE 18:2 (sn-1)	LC/MS Lipid	1.01.E-01	7.91.E-02	1.25.E-01	1.01.E-01	1.12.E-01	1.63.E-01	0.993	0.706	0.769	0.178
LPE 18:2 (sn-2)	LC/MS Lipid	1.33.E-01	1.04.E-01	1.52.E-01	1.43.E-01	1.28.E-01	1.91.E-01	0.932	0.812	0.795	0.105
LPE 18:1 (sn-1)	LC/MS Lipid	4.71.E-02	4.67.E-02	8.50.E-02	5.16.E-02	5.12.E-02	1.07.E-01	0.914	0.912	0.796	0.218
LPE 18:1 (sn-2)	LC/MS Lipid	9.84.E-02	8.97.E-02	1.81.E-01	9.99.E-02	1.06.E-01	2.12.E-01	0.985	0.849	0.851	0.200
LPE 18:0 (sn-1)	LC/MS Lipid	1.11.E-01	9.75.E-02	1.23.E-01	1.01.E-01	1.13.E-01	1.70.E-01	1.099	0.861	0.725	0.398
LPE 18:0 (sn-2)	LC/MS Lipid	1.70.E-01	1.55.E-01	1.81.E-01	1.57.E-01	1.76.E-01	2.27.E-01	1.079	0.880	0.797	0.394
LPE 20:4 (sn-1)	LC/MS Lipid	4.21.E-02	4.60.E-02	6.03.E-02	4.35.E-02	5.94.E-02	7.48.E-02	0.968	0.774	0.806	0.146
LPE 20:4 (sn-2)	LC/MS Lipid	4.34.E-02	4.80.E-02	5.33.E-02	4.77.E-02	5.98.E-02	7.55.E-02	0.909	0.804	0.706	0.133
LPE 22:6 (sn-1)	LC/MS Lipid	3.36.E-02	5.46.E-02	5.57.E-02	4.15.E-02	6.60.E-02	8.71.E-02	0.810	0.827	0.640	0.147
LPE 22:6 (sn-2)	LC/MS Lipid	3.57.E-02	4.07.E-02	6.07.E-02	3.21.E-02	5.01.E-02	6.72.E-02	1.110	0.811	0.904	0.403
PE 16:0-16:1/14:0-18:1	LC/MS Lipid	1.45.E-02	1.71.E-02	2.42.E-02	1.69.E-02	1.86.E-02	3.07.E-02	0.858	0.923	0.787	0.158
PE 16:0p-18:1	LC/MS Lipid	1.08.E-02	1.01.E-02	1.08.E-02	1.16.E-02	9.87.E-03	1.20.E-02	0.934	1.024	0.895	0.310
PE 16:0e-18:1	LC/MS Lipid	3.88.E-02	3.29.E-02	6.16.E-02	3.79.E-02	3.47.E-02	6.03.E-02	1.023	0.948	1.022	0.909
PE 16:0-18:3	LC/MS Lipid	2.89.E-02	2.39.E-02	2.77.E-02	2.27.E-02	2.51.E-02	3.41.E-02	1.275	0.955	0.814	0.920
PE 16:1-18:1/16:0-18:2	LC/MS Lipid	1.03.E-01	7.41.E-02	7.33.E-02	1.02.E-01	6.37.E-02	7.03.E-02	1.019	1.163	1.043	0.197
PE 16:0-18:1	LC/MS Lipid	7.48.E-02	5.26.E-02	6.34.E-02	7.20.E-02	5.81.E-02	5.56.E-02	1.038	0.905	1.140	0.707
PE 16:0p-20:4	LC/MS Lipid	3.47.E-02	4.94.E-02	4.19.E-02	3.37.E-02	4.71.E-02	4.28.E-02	1.030	1.049	0.980	0.473
PE 16:0p-20:3/16:0e-20:4	LC/MS Lipid	5.68.E-02	7.00.E-02	7.26.E-02	5.14.E-02	6.66.E-02	7.15.E-02	1.103	1.051	1.016	0.115
PE 18:1p-18:1/18:0p-18:2/18:0e-18:3	LC/MS Lipid	9.14.E-02	6.26.E-02	5.86.E-02	9.32.E-02	5.96.E-02	6.01.E-02	0.980	1.051	0.975	0.962
PE 17:0-18:2	LC/MS Lipid	1.18.E-02	2.23.E-03	2.90.E-03	7.32.E-03	4.03.E-03	1.37.E-03	1.612	0.553	2.114	0.520
PE 18:0e-18:2	LC/MS Lipid	5.20.E-02	4.64.E-02	6.21.E-02	5.36.E-02	4.96.E-02	5.24.E-02	0.971	0.935	1.185	0.725
PE 18:0p-18:1	LC/MS Lipid	4.89.E-02	4.24.E-02	4.16.E-02	4.12.E-02	3.70.E-02	4.12.E-02	1.185	1.145	1.008	0.175
PE 18:0e-18:1	LC/MS Lipid	2.11.E-02	3.17.E-02	1.88.E-02	2.22.E-02	3.10.E-02	2.24.E-02	0.952	1.024	0.840	0.408
PE 18:2-18:3	LC/MS Lipid	5.71.E-03	8.52.E-03	1.71.E-02	6.06.E-03	6.67.E-03	2.00.E-02	0.942	1.278	0.856	0.767
PE 16:0-20:5	LC/MS Lipid	2.91.E-02	5.95.E-02	4.33.E-02	2.41.E-02	5.58.E-02	4.81.E-02	1.204	1.067	0.898	0.726
PE 18:2-18:2	LC/MS Lipid	6.99.E-02	6.64.E-02	9.17.E-02	5.82.E-02	5.48.E-02	9.65.E-02	1.202	1.212	0.950	0.378
PE 16:0-20:4	LC/MS Lipid	9.40.E-02	7.05.E-02	5.81.E-02	7.99.E-02	6.95.E-02	5.41.E-02	1.176	1.014	1.074	0.249
PE 18:1-18:2	LC/MS Lipid	1.60.E-01	1.03.E-01	1.44.E-01	1.71.E-01	9.56.E-02	1.29.E-01	0.936	1.078	1.116	0.669
PE 18:1-18:1/18:0-18:2	LC/MS Lipid	5.09.E-01	4.02.E-01	3.86.E-01	5.69.E-01	3.77.E-01	3.48.E-01	0.894	1.066	1.111	0.979
PE 16:0-20:1/18:0-18:1	LC/MS Lipid	2.25.E-01	2.15.E-01	2.20.E-01	2.23.E-01	2.04.E-01	1.96.E-01	1.010	1.056	1.118	0.179
PE 16:0p-22:6	LC/MS Lipid	1.63.E-02	3.08.E-02	2.56.E-02	1.88.E-02	2.85.E-02	2.32.E-02	0.868	1.083	1.100	0.693
PE 18:0p-20:5/18:1p-20:4/16:0e-22:6	LC/MS Lipid	1.00.E-01	1.25.E-01	1.40.E-01	9.11.E-02	1.25.E-01	1.40.E-01	1.099	0.994	1.000	0.472
PE 18:1p-20:3/16:0p-22:4	LC/MS Lipid	3.67.E-02	5.50.E-02	4.99.E-02	3.60.E-02	5.05.E-02	5.57.E-02	1.018	1.090	0.895	0.952
PE 18:0p-20:4	LC/MS Lipid	1.42.E-01	2.19.E-01	1.74.E-01	1.32.E-01	2.31.E-01	1.74.E-01	1.079	0.946	0.998	0.917
PE 18:1e-20:3	LC/MS Lipid	1.35.E-01	2.15.E-01	1.76.E-01	1.20.E-01	2.17.E-01	1.58.E-01	1.127	0.992	1.111	0.231
PE 16:1-22:6/18:2-20:5	LC/MS Lipid	1.08.E-02	1.46.E-02	1.65.E-02	7.94.E-03	1.45.E-02	1.48.E-02	1.358	1.003	1.114	0.201
PE 18:2-20:4/18:1-20:5	LC/MS Lipid	3.81.E-01	2.91.E-01	2.64.E-01	3.39.E-01	2.99.E-01	2.71.E-01	1.123	0.972	0.973	0.650
PE 16:0-22:6/16:1-22:5/20:2-18:4	LC/MS Lipid	3.81.E-01	2.91.E-01	2.64.E-01	3.39.E-01	2.99.E-01	2.71.E-01	1.123	0.972	0.973	0.651
PE 18:1-20:4	LC/MS Lipid	1.02.E-01	6.87.E-02	7.07.E-02	9.19.E-02	6.33.E-02	6.56.E-02	1.110	1.086	1.078	0.050
PE 18:0-20:5	LC/MS Lipid	3.58.E-02	5.29.E-02	5.15.E-02	4.11.E-02	5.41.E-02	4.58.E-02	0.871	0.977	1.124	0.940
PE 18:0-20:4	LC/MS Lipid	3.33.E-01	2.76.E-01	2.34.E-01	3.15.E-01	2.85.E-01	2.22.E-01	1.057	0.965	1.052	0.518
PE 20:1-18:2	LC/MS Lipid	2.76.E-02	2.24.E-02	2.11.E-02	2.56.E-02	2.03.E-02	2.31.E-02	1.078	1.106	0.914	0.651
PE 18:0-20:3	LC/MS Lipid	9.02.E-02	7.20.E-02	7.07.E-02	8.53.E-02	8.04.E-02	6.63.E-02	1.058	0.896	1.067	0.946
PE 18:1-20:1	LC/MS Lipid	7.54.E-03	6.40.E-03	3.14.E-03	1.04.E-02	5.36.E-03	4.59.E-03	0.727	1.192	0.684	0.439
PE 20:0-18:2	LC/MS Lipid	2.47.E-02	3.44.E-02	2.59.E-02	2.50.E-02	3.67.E-02	3.24.E-02	0.989	0.938	0.800	0.240
PE 18:0-20:1	LC/MS Lipid	1.39.E-02	1.78.E-02	1.56.E-02	1.21.E-02	2.11.E-02	1.34.E-02	1.147	0.843	1.164	0.913
PE 18:0p-22:6/18:1p-22:5	LC/MS Lipid	6.22.E-02	9.33.E-02	6.68.E-02	5.59.E-02	9.35.E-02	6.48.E-02	1.113	0.998	1.031	0.293
PE 17:0-22:6	LC/MS Lipid	5.31.E-03	2.93.E-03	5.26.E-03	6.29.E-03	4.31.E-03	2.03.E-03	0.845	0.681	2.596	0.859
PE 18:0p-22:5/18:1p-22:4	LC/MS Lipid	8.32.E-02	1.31.E-01	9.07.E-02	8.39.E-02	1.20.E-01	9.01.E-02	0.992	1.088	1.007	0.430
PE 18:1-22:6	LC/MS Lipid	2.07.E-02	2.04.E-02	2.18.E-02	2.03.E-02	1.71.E-02	2.19.E-02	1.019	1.195	0.996	0.374
PE 18:0-22:6	LC/MS Lipid	9.63.E-02	1.00.E-01	7.19.E-02	9.16.E-02	9.84.E-02	7.39.E-02	1.051	1.018	0.972	0.531
PE 18:0-22:5	LC/MS Lipid	5.15.E-02	4.72.E-02	4.10.E-02	5.68.E-02	5.17.E-02	3.90.E-02	0.906	0.913	1.051	0.376
FA 12:0 Lauric acid	LC/MS Lipid	6.76.E-02	3.28.E-02	4.34.E-02	5.43.E-02	3.09.E-02	4.17.E-02	1.244	1.061	1.042	0.278

FA 14:1 (n-5) Myristoleic acid	LC/MS Lipid	8.58.E-02	2.23.E-02	3.83.E-02	2.35.E-02	1.97.E-02	3.98.E-02	3.647	1.129	0.961	0.414
FA 14:0 Myristic acid	LC/MS Lipid	2.45.E-01	9.56.E-02	1.51.E-01	9.24.E-02	9.23.E-02	1.36.E-01	2.651	1.036	1.108	0.358
FA 16:1 (n-7) Palmitoleic acid	LC/MS Lipid	2.13.E+00	3.25.E-01	1.12.E+00	5.65.E-01	2.73.E-01	9.88.E-01	3.765	1.189	1.130	0.359
FA 16:0 Palmitic acid	LC/MS Lipid	4.81.E+00	3.07.E+00	4.51.E+00	3.37.E+00	2.90.E+00	3.72.E+00	1.429	1.059	1.213	0.160
FA 17:1 (n-7) cis-10-Heptadecanoic acid	LC/MS Lipid	2.80.E-01	3.56.E-02	7.40.E-02	4.82.E-02	3.92.E-02	5.61.E-02	5.807	0.908	1.320	0.389
FA 18:4 (n-3) Stearidonic acid	LC/MS Lipid	7.47.E-03	8.65.E-03	1.37.E-02	4.94.E-03	5.54.E-03	1.29.E-02	1.512	1.563	1.060	0.093
FA 18:3 (n-3) Alpha-linolenic acid (n-6) gamma-Linolenic aci	LC/MS Lipid	2.84.E-01	2.00.E-01	4.95.E-01	1.95.E-01	1.70.E-01	4.50.E-01	1.453	1.174	1.099	0.092
FA 18:2 (n-6) Linoleic acid	LC/MS Lipid	2.10.E+00	1.31.E+00	2.16.E+00	1.45.E+00	1.16.E+00	1.94.E+00	1.448	1.125	1.111	0.166
FA 18:1 (n-9) cis-Oleic acid (n-7) cis-Vaccenic acid	LC/MS Lipid	5.92.E+00	3.24.E+00	6.75.E+00	4.24.E+00	2.79.E+00	5.87.E+00	1.398	1.158	1.151	0.110
FA 18:0 Stearic acid	LC/MS Lipid	3.46.E+00	2.85.E+00	2.43.E+00	2.89.E+00	2.92.E+00	2.03.E+00	1.199	0.978	1.195	0.253
FA 20:5 (n-3) Eicosapentaenoic acid	LC/MS Lipid	2.02.E-02	4.52.E-02	3.16.E-02	1.55.E-02	3.91.E-02	2.81.E-02	1.304	1.154	1.124	0.023
FA 20:4 (n-6) Arachidonic acid	LC/MS Lipid	6.78.E-01	5.56.E-01	4.94.E-01	2.62.E-01	3.86.E-01	3.04.E-01	2.588	1.438	1.626	0.082
FA 20:3 (n-6) Dihomo-gamma-linolenic acid (n-9) Mead aci	LC/MS Lipid	5.92.E-02	4.51.E-02	6.27.E-02	4.80.E-02	4.81.E-02	5.83.E-02	1.235	0.938	1.077	0.412
FA 20:2 (n-6) cis-11-14-Eicosadienoic acid	LC/MS Lipid	1.44.E-01	7.53.E-02	8.76.E-02	6.09.E-02	7.23.E-02	8.46.E-02	2.371	1.042	1.035	0.382
FA 20:1 (n-9) cis-11-Eicosenoic acid	LC/MS Lipid	2.56.E-01	1.24.E-01	2.56.E-01	1.41.E-01	1.11.E-01	2.24.E-01	1.809	1.124	1.145	0.226
FA 22:6 (n-3) Docosahexaenoic acid	LC/MS Lipid	1.01.E-01	1.81.E-01	1.36.E-01	8.65.E-02	1.72.E-01	1.37.E-01	1.168	1.053	0.993	0.238
FA 22:5 (n-6) Docosapentaenoic acid	LC/MS Lipid	7.97.E-02	1.10.E-01	1.11.E-01	7.25.E-02	1.04.E-01	1.01.E-01	1.099	1.060	1.100	0.022
FA 22:4 (n-6) Docosatetraenoic acid	LC/MS Lipid	4.09.E-02	4.16.E-02	4.00.E-02	2.76.E-02	4.29.E-02	3.97.E-02	1.483	0.970	1.008	0.468
FA 23:0 Tricosanoic acid	LC/MS Lipid	7.96.E-02	9.14.E-02	1.02.E-01	6.97.E-02	8.95.E-02	1.00.E-01	1.141	1.022	1.016	0.240
FA 24:1 (n-9) Nervonic acid	LC/MS Lipid	1.53.E-01	1.49.E-01	1.67.E-01	1.20.E-01	1.46.E-01	1.47.E-01	1.283	1.015	1.140	0.175
FA 25:0 Pentacosanoic acid	LC/MS Lipid	2.50.E-01	2.13.E-01	2.19.E-01	1.98.E-01	2.31.E-01	2.17.E-01	1.267	0.923	1.010	0.615
AC 2:0	LC/MS Lipid	4.59.E+00	4.11.E+00	4.34.E+00	4.03.E+00	3.45.E+00	3.37.E+00	1.140	1.192	1.287	0.027
AC 4:0	LC/MS Lipid	2.41.E-02	1.74.E-02	5.81.E-02	2.02.E-02	1.28.E-02	4.62.E-02	1.190	1.361	1.257	0.118
AC 6:0	LC/MS Lipid	8.46.E-03	8.09.E-03	1.09.E-02	8.28.E-03	4.23.E-03	6.99.E-03	1.021	1.911	1.554	0.166
AC 8:0	LC/MS Lipid	4.84.E-02	4.99.E-02	5.96.E-02	3.72.E-02	4.91.E-02	4.90.E-02	1.300	1.016	1.217	0.155
AC 10:0	LC/MS Lipid	9.56.E-02	1.05.E-01	1.28.E-01	8.51.E-02	9.25.E-02	1.10.E-01	1.124	1.137	1.159	0.023
AC 12:0	LC/MS Lipid	2.04.E-02	2.96.E-02	2.71.E-02	2.04.E-02	2.63.E-02	2.67.E-02	1.000	1.124	1.013	0.364
AC 14:0	LC/MS Lipid	7.13.E-03	7.64.E-03	9.01.E-03	4.92.E-03	9.51.E-03	8.27.E-03	1.447	0.804	1.090	0.791
AC 14:1	LC/MS Lipid	2.60.E-02	3.24.E-02	5.33.E-02	2.69.E-02	2.84.E-02	5.25.E-02	0.963	1.138	1.014	0.482
AC 16:0	LC/MS Lipid	5.13.E-02	4.60.E-02	5.39.E-02	3.84.E-02	4.11.E-02	3.76.E-02	1.333	1.121	1.431	0.077
AC 16:1	LC/MS Lipid	1.13.E-02	1.26.E-02	1.73.E-02	8.74.E-03	7.34.E-03	1.34.E-02	1.289	1.723	1.293	0.040
AC 18:0	LC/MS Lipid	3.11.E-02	2.12.E-02	1.78.E-02	1.98.E-02	1.44.E-02	1.25.E-02	1.568	1.475	1.427	0.048
AC 18:1	LC/MS Lipid	9.07.E-02	5.60.E-02	1.09.E-01	6.49.E-02	3.70.E-02	7.19.E-02	1.399	1.514	1.517	0.035
AC 18:2	LC/MS Lipid	4.26.E-02	3.13.E-02	4.73.E-02	2.80.E-02	2.56.E-02	3.33.E-02	1.522	1.223	1.421	0.058

Derivatized metabolites are labeled with 'TMS' (trimethylsilylation) and/or 'meto' (methoximation)

Ether-linked lipid species are labeled with 'e' (plasmanyl) or 'p' (plasmeryl).

Four types of methods, which targeted hydrophilic metabolites (GC/MS), cationic metabolites (LC/MS_Cation), anionic metabolites (LC/MS_Anion) and lipids (LC/MS_Lipid), were employed, and they were shown in the column of 'Method'.

P-values were calculated using the paired Student's *t*-test.

N.D. indicates that the metabolite peak was not detected.

N.A. indicates that statistical test is not available due to insufficiency of the metabolite data.

Abbreviations: LPC, lysophosphatidylcholine; PC, phosphatidylcholine; LPE, lysophosphatidylethanolamine; PE, phosphatidylethanolamine; FA, fatty acid; AC, acylcamitine

PC 201-203 1818-224	LCMS Lipid	1901-00	2281-00	2031-00	1911-00	2341-00	2211-00	1971-00	2391-00	1841-00	1004	1026	1087	1040	1050	0908	0687	1201-00	1031-00	1111-00	1010-00	1081-00	1061-00	1081-00	1101-00	1111-00	0914	1051	0971	0380	1064	0991	0797	
PC 181-220	LCMS Lipid	4516-02	5986-02	4281-02	5986-02	4516-02	4031-02	5271-02	4516-02	4851-02	1231	0963	0942	1460	0813	1135	0641	3116-02	3148-02	2091-02	3101-02	2416-02	3101-02	3101-02	3101-02	3101-02	0966	0975	0251	1115	1151	0989		
PC 190-226	LCMS Lipid	8413-02	1111-01	1011-01	5961-02	1011-01	1321-01	9461-02	1171-01	1021-01	0691	1141	1302	1095	1017	1006	0902	7391-02	9391-02	9511-02	1011-01	7291-02	9311-02	7391-02	9311-02	9311-02	11316	0777	0499	1012	1147	0911	0966	
PC 190-01	LCMS Lipid	5216-02	4381-02	4891-02	6171-02	4381-02	4821-02	5571-02	4821-02	4821-02	1178	0325	0808	1064	0900	0972	0921	3391-02	4401-02	3391-02	3101-02	3101-02	3101-02	3101-02	3101-02	3101-02	1065	0311	0317	0317	0317	0317	0317	
PE 161-01	LCMS Lipid	7961-02	7131-02	1081-01	8461-02	7961-02	1161-01	8311-02	1161-01	1101-01	1086	0966	1074	1048	1011	1020	0380	1041-02	6481-02	5791-02	1021-02	5711-02	6211-02	6211-02	6211-02	6211-02	0888	0881	1070	0822	1140	1111	0558	
PE 181-01	LCMS Lipid	1011-01	1121-01	1141-01	1461-01	1011-01	1141-01	1461-01	1141-01	1141-01	1181	0991	1001	1231	0708	1015	0854	7711-02	7391-02	6711-02	7311-02	6711-02	6711-02	6711-02	6711-02	6711-02	0944	0512	0512	0842	0842	0842	0842	
PE 181-01	LCMS Lipid	1431-01	1281-01	1911-01	1491-01	1431-01	1281-01	1491-01	1431-01	1431-01	1183	0991	0972	1130	0860	0996	0874	9471-02	9361-02	9091-02	1301-02	9371-02	9311-02	9311-02	9311-02	9311-02	0912	0940	1011	1014	0999	1034	0338	
PE 181-01	LCMS Lipid	5316-02	5121-02	1071-01	7311-02	4921-02	9001-02	6611-02	4921-02	1041-01	1417	0962	0913	1293	0324	0972	0877	6371-02	4311-02	4411-02	1301-02	4011-02	9311-02	9311-02	9311-02	9311-02	0870	0335	1004	0963	0909	1029	0096	
PE 181-01	LCMS Lipid	9911-02	1101-01	1101-01	1341-01	1071-01	1341-01	1071-01	1341-01	1341-01	1096	1330	0916	1350	0916	1004	0641	7311-02	7311-02	6801-02	6801-02	7991-02	7991-02	7991-02	7991-02	1066	0999	1002	0948	0948	0948	0948		
PE 181-01	LCMS Lipid	1011-01	1111-01	1701-01	1511-01	1091-01	1481-01	1321-01	8611-02	1011-01	1497	0966	0872	1308	0763	0948	0839	4111-02	6401-02	4231-02	4231-02	4151-02	4491-02	4931-02	5321-02	4621-02	1189	0447	1001	1196	0811	1090	0748	
PE 201-01	LCMS Lipid	1571-01	1781-01	2271-01	2141-01	2081-01	1961-01	1441-01	2241-01	2141-01	1361	0971	0909	1248	0811	0987	0857	7111-01	9421-01	3101-01	7781-01	7731-01	7471-01	8301-01	8201-01	7811-01	1065	0301	0301	0301	0301	0301	0301	
PE 201-01	LCMS Lipid	4311-02	3941-02	7481-02	6761-02	4021-02	6051-02	6211-02	4021-02	8091-02	1554	0227	0808	1436	0909	1082	0985	4111-02	4711-02	3391-02	2951-02	3411-02	3211-02	3211-02	3211-02	3211-02	0641	0766	0828	0720	0845	1041	0050	
PE 201-01	LCMS Lipid	4711-02	4581-02	5051-02	5051-02	4581-02	6431-02	4581-02	6431-02	4581-02	1405	0368	0314	1275	0758	0972	0871	4391-02	4081-02	4081-02	3101-02	3101-02	3101-02	3101-02	3101-02	3101-02	0971	0616	0518	0358	0358	0358	0358	
PE 221-01	LCMS Lipid	4111-02	6401-02	8711-02	5411-02	5611-02	7891-02	5881-02	4201-02	4801-02	1304	0352	0906	1417	0816	0965	0915	4111-02	4081-02	4441-02	1921-02	3461-02	4421-02	4421-02	4421-02	4421-02	0815	0881	0911	0818	0911	0967	0116	
PE 221-01	LCMS Lipid	3171-02	4111-02	4711-02	3171-02	4111-02	4091-02	3171-02	4111-02	3171-02	1095	0901	1094	1001	1483	0967	0849	3461-02	3151-02	3151-02	1921-02	1921-02	3461-02	3461-02	3461-02	3461-02	0972	1089	0961	0853	0853	0853	0853	
PE 1616-1141-01	LCMS Lipid	1691-02	1861-02	1071-02	1471-02	1691-02	1861-02	1071-02	1471-02	1691-02	1012	1002	0920	1012	1002	0920	1417	2281-02	2491-02	2461-02	2461-02	2091-02	2461-02	2461-02	2461-02	2461-02	1081	0776	0748	1194	0823	0832	0332	
PE 1616-11	LCMS Lipid	1341-02	9171-01	1201-02	1061-02	9981-01	1341-02	1081-02	1021-02	1291-02	0914	1011	1111	0928	1028	1074	0951	1211-02	1191-02	1101-02	10771-01	1061-02	1071-02	1281-02	1121-02	1191-02	0910	0724	0960	1016	0909	1082	0151	
PE 1616-11	LCMS Lipid	3791-02	3791-02	3791-02	3791-02	3791-02	3791-02	3791-02	3791-02	3791-02	1371	1010	1072	1441	0971	0909	1025	1461-02	1461-02	1461-02	1461-02	1461-02	1461-02	1461-02	1461-02	1461-02	1114	0958	0816	0901	0924	1021	0846	
PE 1616-11	LCMS Lipid	2271-02	2511-02	2411-02	3011-02	2271-02	2411-02	2511-02	2411-02	3011-02	1335	0996	0950	0910	1225	0934	0924	1461-02	1461-02	1461-02	1461-02	1461-02	1461-02	1461-02	1461-02	1461-02	1114	0958	0816	0901	0924	1021	0846	
PE 1616-11	LCMS Lipid	1021-01	6711-02	7011-02	1021-01	6711-02	7011-02	1021-01	6711-02	7011-02	1005	1101	1001	1072	1341	0971	0909	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025
PE 1616-11	LCMS Lipid	7201-02	5111-02	5561-02	7741-02	5241-02	7421-02	7361-02	5491-02	5891-02	1074	0903	1306	1090	1040	1060	0572	8011-02	8391-02	8071-02	7661-02	8461-02	7711-02	7531-02	7991-02	8791-02	0952	0966	0963	0938	0938	0938	0938	
PE 1616-201	LCMS Lipid	3171-02	4111-02	4711-02	3171-02	4111-02	4091-02	3171-02	4111-02	3171-02	1095	0901	1094	1001	1483	0967	0849	3461-02	3151-02	3151-02	1921-02	1921-02	3461-02	3461-02	3461-02	3461-02	0972	1089	0961	0853	0853	0853	0853	
PE 1616-201-01	LCMS Lipid	5141-02	6661-02	7151-02	5871-02	6661-02	9291-02	5421-02	6661-02	9291-02	1142	1043	1306	1054	1047	1044	0231	5811-02	5421-02	5271-02	5461-02	5421-02	5711-02	5501-02	5421-02	5421-02	0939	1001	0968	0861	0705	1126	0761	
PE 1616-201-01	LCMS Lipid	9311-02	4961-02	4011-02	9281-02	7211-02	6301-02	8641-02	5491-02	5491-02	0994	1214	1366	0927	1044	0987	3891-02	4351-02	3151-02	4021-02	4021-02	3101-02	4321-02	4321-02	4321-02	4321-02	1102	0801	1241	1108	0966	1158	0678	
PE 170-182	LCMS Lipid	7321-01	4011-01	1371-01	9371-01	2781-01	2511-01	1091-02	3101-01	3401-01	1280	0689	1829	1484	0969	2422	0192	4491-01	4461-01	2361-01	5391-01	3171-01	3381-01	3381-01	3551-01	5381-01	1106	0797	0722	0823	1192	1014	0616	
PE 181-201	LCMS Lipid	5341-02	5961-02	5241-02	4241-02	5341-02	5961-02	4241-02	5341-02	5961-02	0791	1086	1082	1400	1106	1056	0961	1781-02	1561-02	1311-02	1272-02	1221-02	1461-02	1411-02	1031-02	1751-02	0724	0781	1011	0300	0459	2296	0566	
PE 181-201	LCMS Lipid	4121-02	3791-02	4121-02	4441-02	4121-02	4441-02	4121-02	4441-02	4121-02	1127	1056	1078	1066	1089	1059	0250	2181-02	2281-02	2461-02	2741-02	2281-02	2461-02	2461-02	2461-02	2461-02	1259	0928	0626	1400	1064	0968	0405	
PE 181-201	LCMS Lipid	2221-02	3101-02	2241-02	2721-02	3101-02	2701-02	2491-02	2071-02	2701-02	1227	1011	1288	1217	0803	0923	0232	1211-02	1341-02	1111-02	1461-02	09781-01	1101-02	13551-02	1181-02	10991-02	1211	1028	0924	1209	0376	0981	0710	
PE 181-201	LCMS Lipid	6061-01	6171-01	2001-02	6271-01	6061-01	2201-02	6881-01	6951-01	6951-01	0973	1101	1466	1947	1072	0317	3791-01	7361-01	3241-01	6731-01	6731-01	6731-01	6731-01	6731-01	6731-01	6731-01	1174	0827	1592	1713	1181	1044	0781	
PE 181-201	LCMS Lipid	2411-02	6581-02	4811-02	3121-02	5011-02	5291-02	3091-02	4311-02	4311-02	1292	0999	1099	1099	1099	1099	1099	4091-02	3681-02	3541-02	4151-02	3411-02	4101-02	4461-02	3971-02	3561-02	1014	0884	1160	1139	1030	1008	0707	
PE 181-201	LCMS Lipid	5831-02	5881-02	6061-02	6061-02	5831-02	6061-02	6061-02	6061-02	6061-02	1007	1110	0909	0929	0973	0712	2461-02	1971-02	2251-02	2381-02	2381-02	2381-02	2381-02	2381-02	2381-02	2381-02	1192	0966	0862	0926	1166	0866	0646	
PE 181-201	LCMS Lipid	7991-02	6931-02	7411-02	8031-02	6931-02	8381-02	9141-02	7271-02	6991-02	1005	0980	1548	1444	1066	1291	0405	9191-02	7471-02	8401-02	7241-02	8791-02	9601-02	7571-02	7111-02	84781-02	0788	1146	1075	0824	0927	0845	0889	
PE 181-218	LCMS Lipid	1711-01	9541-02	1181-01	1411-01	9321-02	1061-01	1821-01	1001-01	2381-01	0822	1121	1064	1489	0978	1079	0899	9101-01	1111-01	1211-01	1121-01	1061-01	9601-01	1131-01	8211-01	1191-01	1151	0867	0827	1165	0827	0986	0477	
PE 181-218	LCMS Lipid	5691-01	3771-01	5481-01	5161-01	3971-01	4361-01	3421-01	3421-01	3421-01	0907	1054</																						

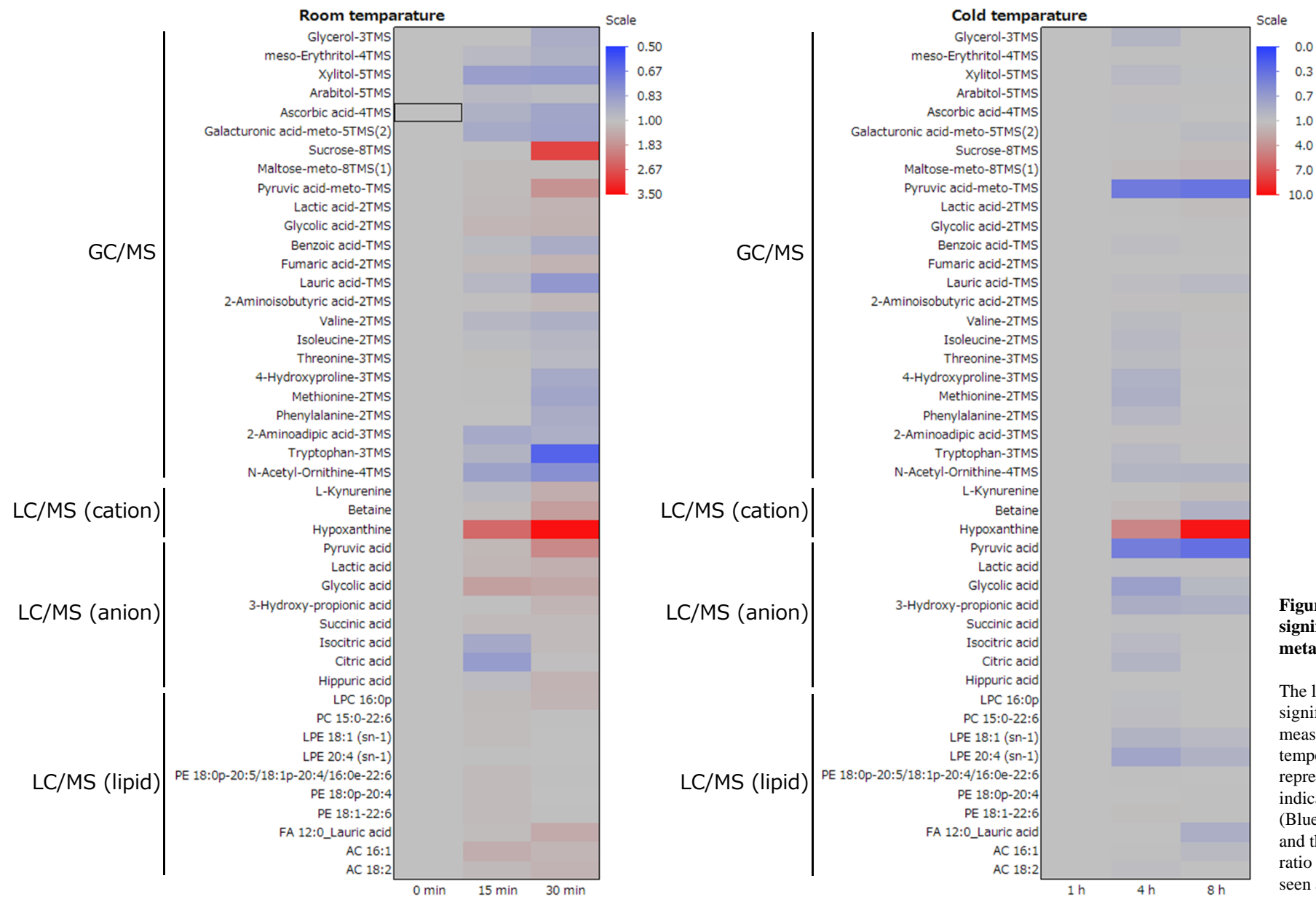


Figure S1. Heat map visualization of the significant changes in the plasma levels of metabolites caused by the storage conditions

The levels, of which the metabolites were significantly altered (one-way repeated measures ANOVA, $p < 0.05$) by storage at room temperature or cold temperature, are represented with the heat maps. Color key indicates the relative value of each metabolite (Blue: lowest, Red: highest; See the color scale), and the relative value is the geometric mean ratio of the plasma metabolite level to the level seen at 0 min at room temperature or at 1 h at cold temperature.