

**Table S1. Summary of metabolites detected by GC-MS/MS in this study.**

Compound name [arb.unit]	Sample	Median (IQR: Q1-Q3)			Raw <i>P</i>
		All (n = 42)	AHU (n = 9)	Overall gout (n = 33)	
<b>2-Isopropylmalic acid-3TMS</b>	<b>Plasma</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>Reference</b>
1,5-Anhydro-glucitol-4TMS ( $\times 10^{-2}$ )	Plasma	0.63 (0–1.00)	0.86 (0.67–1.48)	0.54 (0–0.95)	<b>0.037</b>
1,6-Anhydroglucose-3TMS ( $\times 10^{-2}$ )	Plasma	0.73 (0–0.96)	0.63 (0–1.07)	0.83 (0–0.97)	0.741
1-Hexadecanol-TMS ( $\times 10^{-2}$ )	Plasma	2.16 (0–2.66)	2.46 (2.09–2.53)	2.05 (1.63–2.62)	0.490
2-Aminoadipic acid-3TMS ( $\times 10^{-3}$ )	Plasma	0 (0–9.49)	4.88 (0–8.35)	0 (0–10.47)	0.692
2-Aminobutyric acid-2TMS ( $\times 10^{-2}$ )	Plasma	4.22 (3.29–5.73)	4.02 (3.77–5.79)	4.34 (3.23–5.92)	0.890
2-Aminoethanol-3TMS ( $\times 10^{-1}$ )	Plasma	3.50 (3.00–4.04)	3.59 (2.96–4.29)	3.48 (3.00–4.05)	0.818
2-Aminoisobutyric acid-2TMS ( $\times 10^{-2}$ )	Plasma	6.63 (5.56–7.38)	6.83 (5.26–8.02)	6.51 (5.57–7.40)	0.934
2-Aminopimelic acid-3TMS ( $\times 10^{-1}$ )	Plasma	2.49 (2.13–2.80)	2.14 (1.97–2.48)	2.52 (2.34–2.82)	0.089
2-Deoxy-glucose-4TMS ( $\times 10^{-1}$ )	Plasma	1.11 (0.86–1.37)	1.01 (0.83–1.27)	1.13 (0.87–1.41)	0.382
2-Hydroxybutyric acid-2TMS ( $\times 10^{-1}$ )	Plasma	1.72 (1.35–2.30)	1.39 (1.09–2.02)	1.88 (1.48–2.31)	0.101
2-Hydroxyglutaric acid-3TMS ( $\times 10^{-2}$ )	Plasma	1.32 (0.97–1.38)	1.14 (1.07–1.60)	1.42 (0.94–1.76)	0.988
2-Hydroxyisobutyric acid-2TMS ( $\times 10^{-2}$ )	Plasma	1.09 (0.79–1.38)	0.93 (0.80–1.21)	1.14 (0.77–1.45)	0.399
2-Hydroxyisovaleric acid-2TMS ( $\times 10^{-2}$ )	Plasma	3.78 (2.93–6.23)	3.55 (3.25–4.31)	4.17 (2.73–6.56)	0.613
2-Ketobutyric acid-meto-TMS ( $\times 10^{-2}$ )	Plasma	2.47 (1.94–2.98)	2.14 (1.73–2.64)	2.54 (2.12–3.01)	0.137
2-Ketoglutaric acid-meto-2TMS ( $\times 10^{-2}$ )	Plasma	7.04 (5.53–8.62)	5.18 (4.61–5.85)	7.33 (6.45–9.01)	<b>&lt;0.001</b>
2-Ketoisocaproic acid-meto-TMS ( $\times 10^{-1}$ )	Plasma	1.38 (1.11–1.64)	1.22 (1.17–1.60)	1.39 (1.08–1.70)	0.748
2-Keto-isovaleric acid-meto-TMS ( $\times 10^{-2}$ )	Plasma	2.13 (1.66–2.55)	2.08 (1.86–2.43)	2.18 (1.62–2.72)	0.771
3-Aminoglutaric acid-2TMS ( $\times 10^{-2}$ )	Plasma	1.72 (0–8.58)	6.97 (0.34–9.39)	1.35 (0–7.94)	0.260
3-Aminoisobutyric acid-3TMS ( $\times 10^{-3}$ )	Plasma	0 (0–7.77)	0 (0–0)	0 (0–8.86)	0.082
3-Aminopropanoic acid-3TMS ( $\times 10^{-2}$ )	Plasma	3.59 (1.19–7.08)	3.96 (2.28–5.78)	3.22 (0.57–7.84)	0.866
3-Hydroxybutyric acid-2TMS ( $\times 10^{-1}$ )	Plasma	4.04 (3.26–6.16)	4.04 (2.67–5.06)	4.04 (3.37–6.75)	0.319
3-Hydroxyglutaric acid-3TMS ( $\times 10^{-1}$ )	Plasma	8.01 (7.78–8.18)	8.03 (7.85–8.20)	7.97 (7.70–8.19)	0.613
3-Hydroxyisobutyric acid-2TMS ( $\times 10^{-1}$ )	Plasma	1.90 (1.40–2.36)	1.84 (1.25–2.25)	1.93 (1.52–2.55)	0.263
3-Hydroxyisovaleric acid-2TMS ( $\times 10^{-2}$ )	Plasma	4.75 (3.86–5.35)	4.79 (3.42–5.29)	4.71 (4.02–5.36)	0.382

3-Hydroxypropionic acid-2TMS ( $\times 10^{-2}$ )	Plasma	7.08 (6.32–8.13)	6.45 (5.63–8.04)	7.38 (6.42–8.13)	0.334
3-Methyl-2-oxovaleric acid-meto-TMS ( $\times 10^{-1}$ )	Plasma	1.24 (1.02–1.64)	1.22 (0.96–1.40)	1.30 (1.01–1.65)	0.434
3-Phenyllactic acid-2TMS ( $\times 10^{-3}$ )	Plasma	2.62 (0–8.78)	0 (0–7.59)	5.36 (0–10.02)	0.219
4-Aminobutyric acid-3TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.935
4-Hydroxyphenyllactic acid-3TMS ( $\times 10^{-2}$ )	Plasma	6.51 (4.68–8.55)	5.09 (4.14–7.47)	6.66 (4.91–8.84)	0.163
4-Hydroxyphenylpyruvic acid-meto-2TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.455
4-Hydroxyproline-3TMS ( $\times 10^{-1}$ )	Plasma	1.61 (0.11–3.74)	3.15 (0.20–4.00)	0.80 (0.71–3.63)	0.365
5-Hydroxymethyl-2-furoic acid-2TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.602
5-Methoxytryptamine-2TMS ( $\times 10^{-2}$ )	Plasma	1.52 (0.91–1.88)	1.65 (0.34–2.91)	1.44 (0.95–1.80)	0.724
5-Oxoproline-2TMS	Plasma	7.17 (5.85–7.84)	7.77 (6.71–8.75)	6.86 (5.72–7.71)	0.064
Acetoacetic acid-meto-TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.354
Acetylglycine-TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.279
Aconitic acid-3TMS ( $\times 10^{-3}$ )	Plasma	0 (0–1.70)	0 (0–0)	0 (0–7.46)	0.065
Adipic acid-2TMS ( $\times 10^{-3}$ )	Plasma	8.34 (4.69–11.11)	9.25 (2.48–12.48)	8.21 (4.66–11.11)	0.988
Alanine-2TMS	Plasma	24.1 (20.1–27.9)	24.4 (21.1–27.5)	23.8 (20.1–28.2)	0.635
Allose-meto-5TMS ( $\times 10^{-2}$ )	Plasma	9.00 (6.37–11.04)	7.50 (5.78–9.90)	9.12 (6.42–11.49)	0.238
Arabitol-5TMS ( $\times 10^{-2}$ )	Plasma	0.26 (0–1.15)	0 (0–0.88)	0.53 (0–1.26)	0.302
Arachidonic acid-TMS ( $\times 10^{-1}$ )	Plasma	0.72 (0.52–0.86)	0.85 (0.73–1.02)	0.67 (0.43–0.83)	<b>0.015</b>
Arginine-3TMS ( $\times 10^{-2}$ )	Plasma	1.95 (0.65–3.08)	2.19 (1.12–3.00)	1.83 (0.30–3.21)	0.634
Asparagine-3TMS ( $\times 10^{-2}$ )	Plasma	1.43 (0–6.17)	6.38 (0–7.56)	1.31 (0–5.61)	0.380
Aspartic acid-3TMS ( $\times 10^{-2}$ )	Plasma	1.31 (0–8.06)	6.46 (0–8.76)	1.08 (0–7.48)	0.322
Azelaic acid-2TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.787
Benzoic acid-TMS ( $\times 10^{-1}$ )	Plasma	5.62 (4.84–6.62)	5.40 (4.68–6.27)	5.77 (4.91–7.08)	0.453
Caproic acid-TMS ( $\times 10^{-1}$ )	Plasma	1.18 (1.03–1.39)	1.30 (1.07–1.41)	1.17 (0.95–1.41)	0.350
Cholesterol-TMS ( $\times 10^{-2}$ )	Plasma	0.99 (0.71–1.28)	1.30 (0.79–1.51)	0.96 (0.68–1.12)	0.153
Citramalic acid-3TMS ( $\times 10^{-2}$ )	Plasma	0.73 (0–1.06)	0.94 (0–1.21)	0.71 (0–1.00)	0.461
Citric acid-4TMS ( $\times 10^{-1}$ )	Plasma	3.61 (3.10–4.07)	3.16 (2.94–3.79)	3.77 (3.35–4.15)	0.305
Citrulline-3TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.602
Creatinine-3TMS ( $\times 10^{-3}$ )	Plasma	0 (0–5.41)	0 (0–6.63)	0 (0–5.16)	0.926

Cystamine-nTMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.602
Cysteine-3TMS ( $\times 10^{-2}$ )	Plasma	2.21 (0–8.53)	7.64 (0.31–11.68)	1.93 (0–7.40)	0.115
Cystine-4TMS ( $\times 10^{-2}$ )	Plasma	3.12 (2.46–4.51)	2.58 (1.62–3.01)	3.22 (2.59–5.06)	0.055
Decanoic acid-TMS ( $\times 10^{-2}$ )	Plasma	6.69 (5.63–7.34)	6.66 (6.02–7.09)	6.74 (5.25–7.46)	0.915
Docosahexaenoic acid-TMS ( $\times 10^{-2}$ )	Plasma	1.20 (0–1.78)	0.55 (0–1.45)	1.25 (0.38–1.93)	0.117
Eicosapentaenoic acid-TMS ( $\times 10^{-2}$ )	Plasma	7.33 (5.33–8.83)	9.31 (7.38–9.53)	7.18 (4.92–8.55)	<b>0.013</b>
Elaidic acid-TMS ( $\times 10^{-2}$ )	Plasma	5.92 (4.74–7.34)	4.99 (3.78–6.12)	6.61 (5.02–7.98)	<b>0.033</b>
Fructose-meto-5TMS ( $\times 10^{-2}$ )	Plasma	2.04 (1.32–4.26)	2.36 (1.81–5.55)	1.97 (1.22–2.57)	0.125
Fumaric acid-2TMS ( $\times 10^{-2}$ )	Plasma	1.98 (1.74–2.40)	1.82 (1.50–2.27)	2.02 (1.83–2.47)	0.129
Galacturonic acid-meto-5TMS ( $\times 10^{-2}$ )	Plasma	0 (0–1.00)	0 (0–0.74)	0 (0–1.25)	0.386
Glucaric acid-6TMS ( $\times 10^{-2}$ )	Plasma	1.02 (0.69–1.34)	0.91 (0.32–1.13)	1.04 (0.81–1.44)	0.136
Gluconic acid-6TMS ( $\times 10^{-2}$ )	Plasma	3.42 (2.77–4.26)	3.58 (2.80–4.27)	3.42 (2.73–4.29)	0.939
Glucosamine-5TMS ( $\times 10^{-2}$ )	Plasma	1.86 (1.31–2.30)	1.85 (1.60–2.23)	1.90 (1.10–2.31)	0.701
Glucose-meto-5TMS	Plasma	7.02 (5.98–8.67)	5.88 (4.93–6.75)	7.43 (6.35–9.07)	<b>0.006</b>
Glucuronic acid-meto-5TMS ( $\times 10^{-2}$ )	Plasma	1.90 (1.39–2.71)	1.73 (1.10–2.16)	2.01 (1.59–2.99)	0.203
Glutamic acid-3TMS ( $\times 10^{-1}$ )	Plasma	2.80 (2.37–5.87)	4.59 (0.58–7.09)	1.70 (0.22–4.90)	0.101
Glutamine-3TMS ( $\times 10^{-1}$ )	Plasma	4.82 (1.28–8.37)	7.33 (1.71–9.59)	4.74 (1.23–8.36)	0.305
Glutaric acid-2TMS ( $\times 10^{-2}$ )	Plasma	1.62 (1.16–2.02)	1.65 (1.35–1.76)	1.56 (1.16–2.06)	0.818
Glyceric acid-3TMS ( $\times 10^{-1}$ )	Plasma	1.27 (1.10–1.56)	1.28 (1.21–1.68)	1.27 (1.10–1.56)	0.530
Glycerol 3-phosphate-4TMS ( $\times 10^{-2}$ )	Plasma	0 (0–1.25)	0 (0–0.94)	0.95 (0–1.29)	0.109
Glycerol-3TMS ( $\times 10^{-1}$ )	Plasma	1.00 (0.80–1.25)	1.06 (0.79–1.23)	0.99 (0.80–1.34)	0.988
Glycine-3TMS	Plasma	4.87 (3.25–5.88)	5.92 (4.09–7.49)	4.81 (3.07–5.66)	0.101
Glycolic acid-2TMS ( $\times 10^{-1}$ )	Plasma	2.15 (1.93–2.39)	2.19 (1.91–2.45)	2.12 (1.92–2.37)	0.771
Glyoxylic acid-meto-TMS ( $\times 10^{-1}$ )	Plasma	4.95 (4.64–5.40)	5.06 (4.73–5.31)	4.93 (4.47–5.66)	0.963
Histidine-3TMS ( $\times 10^{-1}$ )	Plasma	1.50 (0.54–2.76)	1.64 (0.93–2.91)	1.24 (0.43–2.91)	0.350
Homocysteine-3TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.602
Hydroxylamine-3TMS ( $\times 10^{-1}$ )	Plasma	6.39 (5.50–8.19)	6.24 (4.48–6.86)	7.32 (5.60–8.45)	0.154
Hypotaurine-3TMS ( $\times 10^{-2}$ )	Plasma	0.82 (0–1.55)	0.84 (0–1.11)	0.81 (0–1.61)	0.646
Hypoxanthine-2TMS ( $\times 10^{-2}$ )	Plasma	0 (0–0.81)	0 (0–1.18)	0 (0–0.79)	0.488

Indol-3-acetic acid-2TMS ( $\times 10^{-2}$ )	Plasma	3.32 (2.11–3.90)	3.89 (3.10–5.10)	3.15 (2.00–3.61)	0.078
Inositol-6TMS ( $\times 10^{-1}$ )	Plasma	1.43 (1.11–1.83)	1.31 (0.99–1.75)	1.49 (1.11–1.92)	0.453
Isocitric acid-4TMS ( $\times 10^{-2}$ )	Plasma	2.18 (1.96–2.73)	1.89 (1.62–2.13)	2.34 (2.07–2.86)	<b>0.015</b>
Isoleucine-2TMS	Plasma	2.89 (1.61–3.63)	3.39 (2.38–3.53)	2.87 (1.43–3.73)	0.366
Kynurenine-3TMS ( $\times 10^{-3}$ )	Plasma	0 (0–5.11)	0 (0–5.36)	0 (0–4.60)	0.985
Lactic acid-2TMS	Plasma	7.42 (6.38–9.41)	6.28 (5.63–7.71)	7.86 (6.77–10.00)	<b>0.018</b>
Lactose-meto-8TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.602
Lauric acid-TMS ( $\times 10^{-1}$ )	Plasma	0.88 (0.71–1.03)	0.99 (0.89–1.03)	0.83 (0.67–1.06)	0.137
Leucine-2TMS	Plasma	5.56 (3.07–6.85)	6.85 (4.59–7.24)	5.39 (2.72–6.28)	0.083
Linoleic acid-TMS ( $\times 10^{-1}$ )	Plasma	1.51 (1.19–1.86)	1.44 (1.11–1.68)	1.53 (1.24–1.92)	0.471
Lysine-4TMS	Plasma	0.57 (0.36–0.86)	0.59 (0.51–0.97)	0.55 (0.35–0.81)	0.319
Lyxose-meto-4TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.602
Maleic acid-2TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.860
Malic acid-3TMS ( $\times 10^{-3}$ )	Plasma	5.02 (0–6.70)	4.62 (0–5.33)	5.51 (0–7.05)	0.349
Mannitol-6TMS	Plasma	1.04 (0.87–1.26)	0.94 (0.78–1.03)	1.10 (0.91–1.35)	<b>0.033</b>
Mannose-meto-5TMS ( $\times 10^{-1}$ )	Plasma	1.23 (0.92–1.43)	0.93 (0.85–1.37)	1.24 (1.03–1.60)	0.095
Margaric acid-TMS ( $\times 10^{-2}$ )	Plasma	4.10 (3.62–4.88)	4.39 (3.78–5.08)	4.01 (3.51–4.85)	0.434
meso-Erythritol-4TMS ( $\times 10^{-3}$ )	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.174
Methionine-2TMS ( $\times 10^{-2}$ )	Plasma	0 (0–2.66)	2.39 (0–3.73)	0 (0–2.53)	0.343
Myristic acid-TMS ( $\times 10^{-1}$ )	Plasma	1.53 (1.26–1.82)	1.70 (1.44–1.85)	1.50 (1.16–1.80)	0.193
N6-Acetyllysine-2TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.602
N-Acetylglutamine-3TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.279
Niacinamide-TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.602
Nicotinic acid-TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.833
Nonanoic acid-TMS ( $\times 10^{-1}$ )	Plasma	3.63 (2.98–6.88)	6.84 (6.27–7.29)	3.31 (2.67–5.93)	<b>0.004</b>
Octadecanol-TMS ( $\times 10^{-2}$ )	Plasma	8.08 (7.18–9.13)	7.53 (7.22–8.30)	8.15 (6.98–9.25)	0.193
Octanoic acid-TMS ( $\times 10^{-2}$ )	Plasma	6.20 (5.09–6.65)	6.29 (5.78–6.65)	5.83 (4.70–6.65)	0.305
Oleamide-TMS ( $\times 10^{-1}$ )	Plasma	2.58 (2.10–3.82)	2.74 (2.08–3.88)	2.58 (2.14–3.85)	0.818
Oleic acid-TMS ( $\times 10^{-1}$ )	Plasma	4.75 (3.55–5.52)	4.17 (3.06–5.09)	4.76 (3.60–5.75)	0.250

O-Phosphoethanolamine-3TMS ( $\times 10^{-3}$ )	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.821
Ornithine-4TMS	Plasma	1.37 (0.57–1.85)	1.61 (0.75–1.85)	1.33 (0.54–1.90)	0.510
Oxalic acid-2TMS	Plasma	3.60 (3.09–4.09)	3.94 (3.60–4.11)	3.48 (2.97–4.09)	0.214
Palmitic acid-TMS	Plasma	4.77 (3.97–5.61)	5.32 (4.38–5.64)	4.59 (3.96–5.62)	0.471
Palmitoleic acid-TMS ( $\times 10^{-2}$ )	Plasma	4.24 (2.49–5.64)	2.55 (2.05–4.64)	4.59 (2.96–5.80)	0.089
ParaXanthine-TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.480
Phenylacetic acid-TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.279
Phenylalanine-2TMS	Plasma	0.47 (0.07–2.31)	1.75 (0.09–2.57)	0.40 (0.68–2.30)	0.350
Phosphoric acid-3TMS	Plasma	20.8 (19.0–24.3)	23.9 (20.6–27.6)	20.2 (18.2–22.5)	<b>0.024</b>
Proline-2TMS	Plasma	2.13 (1.25–4.06)	2.64 (1.92–4.42)	1.83 (1.22–3.98)	0.203
Psicose-meto-5TMS ( $\times 10^{-2}$ )	Plasma	1.90 (1.27–4.20)	3.16 (1.79–5.00)	1.84 (0.93–3.37)	0.078
Putrescine-4TMS ( $\times 10^{-2}$ )	Plasma	0 (0–1.67)	0 (0–1.71)	0 (0–1.67)	0.854
Pyrogallol-3TMS ( $\times 10^{-3}$ )	Plasma	0 (0–0)	0 (0–5.30)	0 (0–0)	<b>0.006</b>
Pyruvic acid-meto-TMS	Plasma	0.67 (0.57–0.81)	0.60 (0.54–0.67)	0.70 (0.60–0.91)	<b>0.048</b>
Ribitol-5TMS ( $\times 10^{-3}$ )	Plasma	4.33 (0–9.52)	0 (0–6.82)	5.90 (0–9.61)	0.163
Ribonic acid-5TMS ( $\times 10^{-2}$ )	Plasma	1.93 (0–2.69)	0 (0–2.04)	2.22 (0–2.83)	0.170
Serine-3TMS	Plasma	0.48 (0.19–1.02)	0.98 (0.46–1.12)	4.24 (1.81–8.68)	0.083
Sorbitol-6TMS ( $\times 10^{-1}$ )	Plasma	1.31 (0.94–1.97)	1.95 (0.81–2.40)	1.26 (0.95–1.90)	0.305
Sorbose-meto-5TMS ( $\times 10^{-2}$ )	Plasma	1.14 (0–2.18)	2.14 (0.61–4.31)	0.98 (0–1.89)	<b>0.043</b>
Stearic acid-TMS	Plasma	3.36 (2.93–3.86)	3.70 (3.34–4.06)	3.29 (2.88–3.71)	0.137
Succinic acid-2TMS ( $\times 10^{-1}$ )	Plasma	0.87 (0.80–0.96)	0.86 (0.83–0.97)	0.88 (0.78–0.96)	0.725
Sucrose-8TMS ( $\times 10^{-2}$ )	Plasma	0 (0–1.24)	1.69 (0–6.92)	0 (0–0.79)	<b>0.029</b>
Tagatose-meto-5TMS ( $\times 10^{-2}$ )	Plasma	1.14 (0–2.99)	2.12 (0–5.66)	0.83 (0–1.57)	0.165
Tartaric acid-4TMS ( $\times 10^{-3}$ )	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.174
Taurine-3TMS ( $\times 10^{-2}$ )	Plasma	1.33 (0.32–2.13)	1.16 (0.50–2.54)	1.37 (0.21–2.19)	0.841
Threitol-4TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.455
Threonic acid-4TMS ( $\times 10^{-2}$ )	Plasma	3.93 (2.68–4.44)	3.63 (2.60–4.46)	3.97 (2.57–4.53)	0.939
Threonine-3TMS ( $\times 10^{-1}$ )	Plasma	3.80 (1.50–6.70)	6.18 (3.43–6.73)	3.06 (1.37–6.36)	0.182
Triethanolamine-3TMS ( $\times 10^{-2}$ )	Plasma	1.59 (1.16–2.13)	1.58 (1.10–2.90)	1.60 (1.16–2.10)	0.771

Tryptophan-3TMS	Plasma	1.22 (0.93–1.74)	1.58 (1.19–2.20)	1.11 (0.85–1.70)	0.055
Tyramine-3TMS	Plasma	1.20 (0.71–1.67)	1.27 (0.97–1.91)	1.15 (0.68–1.63)	0.366
Tyrosine-3TMS	Plasma	3.35 (2.33–4.74)	3.44 (2.98–4.46)	3.10 (2.16–4.89)	0.490
Urea-2TMS	Plasma	9.39 (7.79–12.19)	10.81 (8.43–11.52)	8.95 (7.67–12.44)	0.453
Uric acid-4TMS	Plasma	1.59 (1.46–1.92)	1.46 (1.39–1.78)	1.60 (1.51–1.95)	0.173
Valine-2TMS	Plasma	13.7 (11.0–16.2)	15.5 (13.6–16.6)	12.6 (10.3–16.3)	0.154
Xanthine-3TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.602
Xylitol-5TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.602
Xylose-meto-4TMS	Plasma	0 (0–0)	0 (0–0)	0 (0–0)	0.455
<b>2-Isopropylmalic acid-3TMS</b>	<b>Urinary</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>Reference</b>
1,6-Anhydroglucose-3TMS ( $\times 10^{-1}$ )	Urinary	2.73 (1.19–3.61)	2.17 (0.59–5.83)	2.75 (1.33–3.56)	0.890
1-Hexadecanol-TMS ( $\times 10^{-1}$ )	Urinary	1.80 (1.46–2.13)	1.93 (1.56–2.27)	1.77 (1.41–2.04)	0.305
2-Aminobutyric acid-2TMS ( $\times 10^{-2}$ )	Urinary	1.17 (0.66–1.70)	1.28 (1.13–1.59)	1.05 (0.61–1.82)	0.350
2-Aminoethanol-3TMS	Urinary	11.01 (7.71–18.13)	14.79 (8.73–20.02)	10.84 (6.84–17.62)	0.490
2-Aminopimelic acid-3TMS	Urinary	8.69 (6.25–13.99)	10.16 (5.04–15.38)	8.44 (6.12–13.23)	0.748
2-Hydroxybutyric acid-2TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.354
2-Hydroxyglutaric acid-3TMS ( $\times 10^{-1}$ )	Urinary	4.98 (3.22–8.02)	5.90 (1.94–8.78)	4.46 (3.31–7.56)	0.794
2-Hydroxyhippuric acid-2TMS ( $\times 10^{-2}$ )	Urinary	3.42 (1.43–6.91)	4.72 (1.98–11.03)	2.79 (1.42–6.32)	0.391
2-Hydroxyisobutyric acid-2TMS ( $\times 10^{-1}$ )	Urinary	1.25 (0.89–1.76)	1.28 (0.67–2.07)	1.22 (0.90–1.71)	0.890
2-Hydroxyisovaleric acid-2TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.220
2-Ketoadipic acid-oxime-3TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.455
2-Ketobutyric acid-meto-TMS ( $\times 10^{-2}$ )	Urinary	1.60 (1.24–1.89)	1.38 (1.13–1.79)	1.62 (1.23–1.92)	0.173
2-Ketoglutaric acid-meto-2TMS	Urinary	0.93 (0.54–1.29)	1.17 (0.29–1.54)	0.90 (0.56–1.20)	0.988
2-Ketoisocaproic acid-meto-TMS ( $\times 10^{-3}$ )	Urinary	0 (0–9.71)	6.61 (0–9.61)	0 (0–10.21)	0.750
2-Keto-isovaleric acid-meto-TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.354
2-Methyl-3-hydroxybutyric acid-2TMS ( $\times 10^{-3}$ )	Urinary	0 (0–1.61)	0 (0–0)	0 (0–6.55)	0.356
2-Phosphoglyceric acid -4TMS ( $\times 10^{-3}$ )	Urinary	0 (0–0)	0 (0–6.60)	0 (0–0)	0.125
3-Aminoglutaric acid-2TMS ( $\times 10^{-2}$ )	Urinary	4.97 (3.03–8.78)	7.64 (5.35–10.38)	4.31 (2.84–8.18)	0.095
3-Aminoisobutyric acid-3TMS ( $\times 10^{-1}$ )	Urinary	2.31 (0.60–11.10)	1.31 (0.79–15.74)	2.84 (0.55–1.16)	0.988
3-Aminopropanoic acid-3TMS ( $\times 10^{-1}$ )	Urinary	0.82 (0.40–2.39)	0.80 (0.32–1.18)	0.82 (0.41–2.94)	0.434

3-Hydroxy-3-methylglutaric acid-3TMS ( $\times 10^{-2}$ )	Urinary	5.34 (3.98–7.42)	6.68 (2.04–7.69)	5.24 (4.14–7.33)	0.842
3-Hydroxyanthranilic acid-3TMS ( $\times 10^{-3}$ )	Urinary	0 (0–8.61)	0 (0–2.72)	0 (0–1.01)	0.443
3-Hydroxybutyric acid-2TMS ( $\times 10^{-1}$ )	Urinary	1.96 (1.61–2.35)	1.75 (1.35–2.15)	2.01 (1.62–2.40)	0.089
3-Hydroxyglutaric acid-3TMS ( $\times 10^{-1}$ )	Urinary	7.93 (7.58–8.26)	8.12 (7.93–8.23)	7.83 (7.52–8.30)	0.214
3-Hydroxyisobutyric acid-2TMS ( $\times 10^{-1}$ )	Urinary	1.65 (1.20–2.13)	1.79 (1.01–2.05)	1.63 (1.25–2.21)	0.725
3-Hydroxyisovaleric acid-2TMS ( $\times 10^{-1}$ )	Urinary	4.10 (3.10–6.28)	4.64 (2.80–5.33)	4.02 (3.08–7.20)	0.657
3-Hydroxyphenylacetic acid-2TMS ( $\times 10^{-2}$ )	Urinary	0 (0–0.91)	0 (0–1.15)	0 (0–0.93)	0.623
3-Hydroxypropionic acid-2TMS ( $\times 10^{-1}$ )	Urinary	1.22 (0.83–2.02)	1.31 (0.77–2.25)	1.18 (0.87–1.74)	0.842
3-Methoxy-4-hydroxybenzoic acid-2TMS ( $\times 10^{-2}$ )	Urinary	1.06 (0–1.80)	0.77 (0–1.08)	1.29 (0–1.95)	0.094
3-Methyl-2-oxovaleric acid-meto-TMS ( $\times 10^{-2}$ )	Urinary	1.49 (0.64–1.95)	0.88 (0.64–1.70)	1.51 (0.72–2.08)	0.499
3-Methyladipic acid-2TMS ( $\times 10^{-2}$ )	Urinary	2.68 (0–5.85)	0 (0–3.04)	2.84 (0–6.42)	0.175
3-Methylglutaric acid-2TMS ( $\times 10^{-2}$ )	Urinary	1.52 (1.01–2.51)	1.48 (1.15–2.23)	1.55 (0.47–2.89)	0.939
3-Phenyllactic acid-2TMS ( $\times 10^{-2}$ )	Urinary	0.24 (0–1.40)	0 (0–0.56)	0.62 (0–1.58)	0.185
3-Phosphoglyceric acid-4TMS ( $\times 10^{-3}$ )	Urinary	0 (0–9.87)	7.35 (0–18.50)	0 (0–8.69)	0.312
3-Sulfinioalanine-3TMS ( $\times 10^{-3}$ )	Urinary	0 (0–3.87)	0 (0–4.51)	0 (0–1.89)	0.318
4-Aminobutyric acid-3TMS ( $\times 10^{-2}$ )	Urinary	4.24 (0–7.43)	7.35 (3.82–9.97)	3.63 (0–6.28)	0.051
4-Hydroxybenzoic acid-2TMS ( $\times 10^{-2}$ )	Urinary	3.10 (1.87–3.89)	2.70 (1.72–3.99)	3.10 (1.99–3.95)	0.890
4-Hydroxyphenylacetic acid-2TMS ( $\times 10^{-1}$ )	Urinary	0.85 (0.35–1.49)	0.93 (0.29–1.51)	7.94 (3.92–1.51)	0.657
4-Hydroxyphenyllactic acid-3TMS ( $\times 10^{-1}$ )	Urinary	1.29 (0.73–2.24)	1.32 (0.41–1.78)	1.27 (0.80–2.45)	0.510
4-Hydroxyproline-3TMS ( $\times 10^{-2}$ )	Urinary	0 (0–5.24)	0 (0–9.19)	0 (0–5.17)	0.986
5-Aminolevulinic acid-meto-3TMS ( $\times 10^{-2}$ )	Urinary	1.33 (0.87–1.82)	1.72 (1.14–2.39)	1.10 (0.42–1.62)	0.106
5-Aminovaleric acid-3TMS ( $\times 10^{-1}$ )	Urinary	0.72 (0.53–1.32)	0.76 (0.52–1.33)	0.70 (0.52–1.24)	0.657
5-Hydroxymethyl-2-furoic acid-2TMS ( $\times 10^{-1}$ )	Urinary	1.50 (0.67–2.24)	1.84 (0.42–2.66)	1.49 (0.66–2.13)	0.842
5-Oxoproline-2TMS	Urinary	9.20 (7.40–11.82)	10.09 (6.18–11.52)	8.49 (7.48–11.85)	0.963
7-Methylguanine-2TMS ( $\times 10^{-1}$ )	Urinary	3.63 (2.25–5.57)	4.00 (2.32–8.43)	3.23 (2.24–5.37)	0.226
Acetoacetic acid-meto-TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.602
Acetylglycine-TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.354
Aconitic acid-3TMS	Urinary	1.64 (0.98–2.71)	2.63 (0.89–2.92)	1.59 (0.98–2.47)	0.530
Adenine-2TMS ( $\times 10^{-1}$ )	Urinary	1.60 (1.18–2.45)	1.72 (1.17–4.07)	1.57 (1.13–2.30)	0.382

Adenosine-4TMS ( $\times 10^{-1}$ )	Urinary	0.91 (0.67–1.51)	1.31 (0.78–2.39)	0.90 (0.61–1.28)	0.108
Adipic acid-2TMS ( $\times 10^{-2}$ )	Urinary	1.70 (1.07–2.85)	1.32 (0.78–1.97)	2.12 (1.10–3.07)	0.163
Alanine-2TMS	Urinary	10.44 (6.52–14.10)	12.72 (8.70–13.82)	10.29 (6.15–14.53)	0.571
Allantoin-3TMS ( $\times 10^{-2}$ )	Urinary	4.54 (1.74–9.02)	4.74 (0.84–1.11)	4.35 (1.84–8.63)	0.939
Allose-meto-5TMS ( $\times 10^{-2}$ )	Urinary	7.20 (4.96–9.53)	7.43 (4.22–24.13)	6.72 (4.92–9.24)	0.350
Arabinose-meto-4TMS ( $\times 10^{-1}$ )	Urinary	3.40 (2.44–5.35)	3.98 (2.15–6.26)	3.19 (2.40–5.20)	0.434
Arabitol-5TMS ( $\times 10^{-1}$ )	Urinary	6.78 (4.37–9.89)	8.37 (4.25–8.74)	6.09 (4.37–10.54)	0.939
Arachidonic acid-TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.602
Arginine-3TMS ( $\times 10^{-1}$ )	Urinary	1.15 (0.40–1.75)	1.51 (1.14–2.33)	0.89 (0.33–1.61)	0.145
Ascorbic acid-4TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.928
Asparagine-3TMS ( $\times 10^{-1}$ )	Urinary	1.27 (0.69–3.31)	1.14 (0–3.21)	1.30 (0.83–3.32)	0.283
Aspartic acid-3TMS ( $\times 10^{-2}$ )	Urinary	4.35 (2.59–7.91)	6.32 (4.82–9.39)	3.85 (2.47–7.50)	0.122
Azelaic acid-2TMS ( $\times 10^{-2}$ )	Urinary	0.91 (0–2.98)	0 (0–0.36)	1.33 (0–3.19)	<b>0.030</b>
Benzoic acid-TMS ( $\times 10^{-1}$ )	Urinary	4.43 (3.49–4.93)	4.45 (3.68–4.80)	4.42 (3.43–5.04)	0.657
Caproic acid-TMS ( $\times 10^{-1}$ )	Urinary	1.09 (0.96–1.24)	1.13 (0.93–1.33)	1.07 (0.96–1.25)	0.988
Catechol-2TMS ( $\times 10^{-2}$ )	Urinary	3.13 (1.28–6.16)	3.18 (2.16–8.76)	2.14 (1.15–5.84)	0.444
Cholesterol-TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.602
Citramalic acid-3TMS ( $\times 10^{-1}$ )	Urinary	3.91 (2.82–5.41)	3.88 (2.20–9.98)	3.95 (2.75–5.23)	0.657
Citric acid-4TMS	Urinary	13.15 (9.33–20.96)	14.94 (7.67–23.22)	13.02 (9.29–19.21)	0.748
Creatinine-3TMS	Urinary	0.65 (0.41–1.03)	1.02 (0.53–2.00)	0.60 (0.40–0.91)	0.055
Cystathionine-4TMS ( $\times 10^{-2}$ )	Urinary	0.11 (0–1.63)	0 (0–0.94)	0.67 (0–1.74)	0.258
Cysteine-3TMS ( $\times 10^{-1}$ )	Urinary	2.13 (1.18–3.62)	2.75 (1.64–4.74)	1.94 (1.09–3.36)	0.238
Cystine-4TMS ( $\times 10^{-2}$ )	Urinary	3.55 (1.42–5.48)	3.64 (3.04–4.43)	2.74 (1.16–7.10)	0.434
Cytosine-2TMS ( $\times 10^{-1}$ )	Urinary	1.42 (0.95–2.08)	1.79 (0.66–2.67)	1.40 (0.94–2.04)	0.635
Decanoic acid-TMS ( $\times 10^{-2}$ )	Urinary	5.40 (4.59–6.54)	5.98 (4.55–7.39)	5.33 (4.67–6.51)	0.471
Dihydroxyacetone phosphate-meto-3TMS ( $\times 10^{-1}$ )	Urinary	1.12 (0.57–1.71)	1.52 (0.63–1.94)	1.02 (0.57–1.60)	0.382
Docosaehaenoic acid-TMS ( $\times 10^{-2}$ )	Urinary	0 (0–1.17)	0 (0–1.40)	0 (0–1.16)	0.919
Elaidic acid-TMS ( $\times 10^{-1}$ )	Urinary	0.94 (0.61–1.35)	0.94 (0.87–1.20)	0.83 (0.59–1.65)	0.417
Ethylmalonic acid-2TMS ( $\times 10^{-1}$ )	Urinary	0.82 (0.50–1.18)	0.96 (0.46–1.11)	0.82 (0.53–1.19)	0.939



Fructose-meto-5TMS ( $\times 10^{-2}$ )	Urinary	4.08 (1.85–8.31)	7.50 (1.47–15.30)	3.82 (1.93–7.46)	0.263
Fucose-meto-4TMS ( $\times 10^{-2}$ )	Urinary	0 (0–1.53)	0 (0–1.89)	0 (0–1.54)	0.696
Fumaric acid-2TMS ( $\times 10^{-2}$ )	Urinary	5.95 (4.17–7.69)	5.23 (3.05–5.98)	6.54 (4.52–7.78)	0.122
Galactitol-6TMS ( $\times 10^{-1}$ )	Urinary	1.49 (0.79–2.44)	1.64 (1.15–4.71)	1.40 (0.78–2.37)	0.214
Galacturonic acid-meto-5TMS	Urinary	1.20 (0.85–1.83)	1.56 (0.74–2.55)	1.14 (0.94–1.79)	0.490
Glucaric acid-6TMS	Urinary	1.11 (0.84–1.62)	1.45 (0.86–2.13)	1.09 (0.83–1.48)	0.366
Gluconic acid-6TMS	Urinary	2.93 (1.95–4.29)	5.08 (1.93–5.51)	2.82 (1.88–3.90)	0.114
Glucosamine-5TMS ( $\times 10^{-1}$ )	Urinary	3.40 (2.20–6.34)	5.78 (3.13–6.95)	3.35 (2.19–6.25)	0.290
Glucose 6-phosphate-meto-6TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.602
Glucose-meto-5TMS ( $\times 10^{-1}$ )	Urinary	4.57 (3.21–7.76)	5.20 (2.60–8.50)	4.38 (3.25–7.08)	0.963
Glucuronic acid-meto-5TMS	Urinary	3.27 (2.04–5.19)	3.83 (1.57–5.51)	3.19 (2.18–4.00)	0.818
Glutamic acid-3TMS ( $\times 10^{-1}$ )	Urinary	1.84 (1.34–2.74)	2.72 (1.44–3.29)	1.70 (1.32–2.60)	0.214
Glutamine-3TMS ( $\times 10^{-1}$ )	Urinary	2.54 (1.14–5.11)	3.65 (2.60–6.14)	2.34 (1.08–5.20)	0.214
Glyceric acid-3TMS ( $\times 10^{-1}$ )	Urinary	1.68 (0.99–2.30)	1.50 (0.82–1.89)	1.93 (1.06–2.38)	0.238
Glycerol 3-phosphate-4TMS ( $\times 10^{-1}$ )	Urinary	2.66 (1.47–4.08)	3.70 (1.68–4.43)	2.51 (1.46–3.86)	0.382
Glycine-3TMS	Urinary	11.93 (8.14–25.81)	17.50 (12.37–28.87)	10.27 (7.78–20.42)	0.122
Glycolic acid-2TMS	Urinary	1.24 (0.93–1.85)	1.48 (0.87–2.38)	1.22 (0.92–1.81)	0.490
Glycyl-Glycine-4TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.056
Guanine-3TMS ( $\times 10^{-2}$ )	Urinary	6.55 (3.14–9.89)	7.87 (4.98–11.56)	6.05 (2.38–7.93)	0.129
Hippuric acid-TMS	Urinary	1.65 (0.60–3.70)	2.62 (0.77–5.62)	1.42 (0.58–3.56)	0.490
Histidine-3TMS	Urinary	3.06 (1.06–6.99)	5.36 (3.09–10.60)	2.19 (0.86–5.51)	0.083
Homocysteine-3TMS ( $\times 10^{-2}$ )	Urinary	0.65 (0–2.02)	2.19 (0–3.95)	0.64 (0–1.69)	0.188
Homogentisic acid-3TMS ( $\times 10^{-3}$ )	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.137
Homovanillic acid-2TMS ( $\times 10^{-2}$ )	Urinary	2.09 (1.00–4.50)	3.02 (0.74–5.28)	1.79 (1.04–4.21)	0.635
Hydroquinone-2TMS ( $\times 10^{-2}$ )	Urinary	0 (0–1.17)	0 (0–1.63)	0 (0–1.19)	0.898
Hydroxylamine-3TMS	Urinary	0.84 (0.65–1.00)	0.67 (0.50–0.79)	0.90 (0.70–1.05)	<b>0.007</b>
Hypotaurine-3TMS ( $\times 10^{-2}$ )	Urinary	0 (0–5.66)	0 (0–0.68)	1.94 (0–6.37)	<b>0.043</b>
Hypoxanthine-2TMS ( $\times 10^{-1}$ )	Urinary	2.16 (1.25–3.43)	2.92 (1.82–3.97)	2.15 (1.14–3.42)	0.366
Indol-3-acetic acid-TMS ( $\times 10^{-2}$ )	Urinary	1.75 (0–3.74)	1.50 (0.59–4.03)	1.82 (0–3.87)	0.721

Inositol-6TMS ( $\times 10^{-1}$ )	Urinary	2.48 (1.78–3.92)	2.30 (1.77–3.00)	2.70 (1.77–4.10)	0.490
Isobutyrylglycine-TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.928
Isocitric acid-4TMS	Urinary	2.99 (2.35–5.69)	4.63 (2.14–5.84)	2.98 (2.40–5.64)	0.890
Isoleucine-2TMS ( $\times 10^{-1}$ )	Urinary	3.19 (1.56–4.53)	3.47 (2.91–4.82)	2.83 (1.46–4.34)	0.334
Isovalerylglycine-TMS ( $\times 10^{-3}$ )	Urinary	0 (0–0)	0 (0–2.37)	0 (0–0)	0.186
Kynurenic acid-2TMS ( $\times 10^{-1}$ )	Urinary	1.17 (0.69–2.00)	1.73 (0.65–3.32)	1.14 (0.73–1.79)	0.290
Kynurenine-2TMS ( $\times 10^{-1}$ )	Urinary	0.59 (0.34–1.20)	0.98 (0.36–1.29)	0.52 (0.30–1.10)	0.382
Lactic acid-2TMS	Urinary	0.86 (0.64–1.15)	0.69 (0.55–0.91)	0.97 (0.68–1.17)	<b>0.045</b>
Lactose-meto-8TMS ( $\times 10^{-2}$ )	Urinary	1.83 (1.05–5.14)	2.44 (0.84–9.05)	1.82 (0.99–4.51)	0.373
Lauric acid-TMS ( $\times 10^{-1}$ )	Urinary	0.85 (0.70–1.03)	0.87 (0.68–0.99)	0.84 (0.69–1.10)	0.702
Leucine-2TMS	Urinary	0.97 (0.50–1.48)	1.21 (0.88–1.49)	0.94 (0.49–1.49)	0.417
Linoleic acid-TMS ( $\times 10^{-2}$ )	Urinary	1.58 (1.30–2.11)	1.57 (1.48–2.28)	1.59 (1.25–2.10)	0.334
Lysine-4TMS ( $\times 10^{-1}$ )	Urinary	3.85 (1.46–6.90)	4.93 (1.98–6.30)	3.69 (1.37–7.88)	0.592
Lyxose-meto-4TMS ( $\times 10^{-1}$ )	Urinary	3.54 (2.54–5.31)	4.03 (2.30–6.39)	3.39 (2.49–5.16)	0.399
Maleic acid-2TMS ( $\times 10^{-2}$ )	Urinary	2.76 (1.76–5.15)	4.10 (1.91–5.35)	2.70 (1.76–5.06)	0.725
Malic acid-3TMS ( $\times 10^{-2}$ )	Urinary	0.43 (0–1.10)	0 (0–1.25)	0.45 (0–1.10)	0.530
Malonic acid-2TMS ( $\times 10^{-2}$ )	Urinary	1.63 (1.04–2.29)	1.27 (1.01–2.03)	1.68 (1.12–2.67)	0.263
Mannitol-6TMS	Urinary	1.41 (0.87–2.92)	1.25 (1.09–2.68)	1.43 (0.80–3.05)	0.748
Mannose-meto-5TMS ( $\times 10^{-1}$ )	Urinary	0.59 (0.32–0.89)	0.43 (0.20–0.69)	0.64 (0.34–0.91)	0.173
Margaric acid-TMS ( $\times 10^{-2}$ )	Urinary	2.67 (2.20–3.40)	2.69 (2.43–3.56)	2.66 (2.15–3.29)	0.530
Mesaconic acid-2TMS ( $\times 10^{-1}$ )	Urinary	0.90 (0.57–1.79)	0.85 (0.48–1.15)	1.04 (0.57–1.93)	0.382
meso-Erythritol-4TMS ( $\times 10^{-1}$ )	Urinary	2.73 (1.81–4.07)	2.95 (1.83–4.22)	2.68 (1.70–4.08)	0.842
Methionine sulfone-2TMS ( $\times 10^{-2}$ )	Urinary	1.29 (0–2.45)	1.51 (0.96–2.67)	1.27 (0–2.47)	0.438
Methionine-2TMS ( $\times 10^{-2}$ )	Urinary	0 (0–1.11)	0 (0–1.63)	0 (0–0.87)	0.400
Methylmalonic acid-2TMS ( $\times 10^{-2}$ )	Urinary	3.54 (2.75–5.05)	3.38 (2.59–5.55)	3.74 (2.73–5.08)	0.988
Methylsuccinic acid-2TMS ( $\times 10^{-2}$ )	Urinary	3.30 (2.42–5.93)	3.09 (2.12–4.06)	3.75 (2.40–6.37)	0.399
Myristic acid-TMS ( $\times 10^{-1}$ )	Urinary	1.23 (1.03–1.62)	1.23 (1.08–1.82)	1.23 (1.01–1.63)	0.635
N6-Acetyllysine-2TMS ( $\times 10^{-1}$ )	Urinary	1.94 (1.02–3.11)	2.45 (1.86–2.87)	1.51 (0.97–3.37)	0.434
N-Acetylaspartic acid-3TMS ( $\times 10^{-1}$ )	Urinary	1.00 (0.54–1.99)	1.88 (0.78–3.03)	0.85 (0.49–1.49)	0.095

N-Acetylglutamine-2TMS ( $\times 10^{-2}$ )	Urinary	1.50 (0.54–2.77)	2.59 (0.75–3.71)	1.43 (0.36–2.77)	0.235
N-Acetylmannosamine-meto-4TMS ( $\times 10^{-2}$ )	Urinary	3.34 (2.39–4.75)	4.26 (2.24–6.18)	3.15 (2.38–4.47)	0.434
N-Acetylneuraminic acid-6TMS ( $\times 10^{-1}$ )	Urinary	1.22 (0.85–1.87)	1.62 (0.77–2.51)	1.14 (0.87–1.68)	0.471
N-Acetylserine-2TMS ( $\times 10^{-2}$ )	Urinary	0.83 (0–1.18)	1.15 (0–1.24)	0.59 (0–1.09)	0.355
N-Acetyltyrosine-2TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.354
Niacinamide-TMS ( $\times 10^{-1}$ )	Urinary	0.77 (0.42–1.18)	0.65 (0.43–1.31)	0.81 (0.42–1.19)	0.635
Nicotinic acid-TMS ( $\times 10^{-2}$ )	Urinary	3.42 (1.20–7.61)	0.99 (0.35–1.37)	5.42 (1.97–8.78)	<b>0.001</b>
Nonanoic acid-TMS ( $\times 10^{-1}$ )	Urinary	3.46 (2.86–4.03)	3.10 (2.53–3.65)	3.53 (2.96–4.06)	0.108
Norepinephrine-5TMS ( $\times 10^{-1}$ )	Urinary	1.19 (0.76–1.75)	1.18 (0.58–2.20)	1.19 (0.79–1.77)	0.702
Norvaline-2TMS ( $\times 10^{-2}$ )	Urinary	0 (0–1.05)	0 (0–1.01)	0 (0–1.23)	0.722
Octadecanol-TMS ( $\times 10^{-1}$ )	Urinary	2.16 (1.94–2.79)	2.24 (2.02–2.98)	2.13 (1.91–2.70)	0.382
Octanoic acid-TMS ( $\times 10^{-2}$ )	Urinary	5.80 (4.98–7.31)	5.34 (4.88–7.17)	5.89 (5.14–7.37)	0.453
Oleamide-TMS ( $\times 10^{-1}$ )	Urinary	2.50 (1.78–3.78)	2.54 (1.99–4.26)	2.47 (1.67–3.70)	0.571
Oleic acid-TMS ( $\times 10^{-1}$ )	Urinary	1.04 (0.73–1.33)	1.22 (1.09–1.35)	0.97 (0.66–1.56)	0.137
O-Phosphoethanolamine-4TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.524
Ornithine-4TMS ( $\times 10^{-1}$ )	Urinary	3.50 (1.77–6.08)	4.07 (2.01–4.89)	3.50 (1.76–6.32)	0.818
Oxalic acid-2TMS ( $\times 10^{-1}$ )	Urinary	3.78 (2.95–4.26)	3.75 (2.65–4.06)	3.78 (3.12–4.50)	0.305
Palmitic acid-TMS	Urinary	3.27 (2.77–3.85)	3.32 (3.03–4.19)	3.26 (2.66–3.80)	0.290
Palmitoleic acid-TMS ( $\times 10^{-2}$ )	Urinary	1.06 (0.67–1.93)	1.57 (0.76–2.11)	1.04 (0.64–1.86)	0.489
Pantothenic acid-3TMS ( $\times 10^{-2}$ )	Urinary	1.05 (0–2.06)	1.51 (0.60–2.83)	0.95 (0–1.85)	0.330
ParaXanthine-TMS ( $\times 10^{-2}$ )	Urinary	3.78 (1.52–8.06)	1.53 (0.33–3.38)	4.67 (2.68–8.45)	<b>0.016</b>
Phenylalanine-2TMS	Urinary	1.50 (0.72–1.92)	1.79 (1.28–2.10)	0.96 (0.69–1.88)	0.154
Phenylpyruvic acid-meto-TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.602
Phosphoric acid-3TMS	Urinary	137.6 (102.2–171.4)	120.0 (94.3–175.1)	139.7 (101.4–170.6)	0.613
Pimelic acid-2TMS ( $\times 10^{-2}$ )	Urinary	0 (0–0.45)	0 (0–0)	0 (0–0.66)	0.259
Proline-2TMS ( $\times 10^{-2}$ )	Urinary	4.18 (2.21–6.31)	4.53 (1.85–6.15)	4.02 (2.46–6.44)	0.866
Protocatechuic acid-3TMS ( $\times 10^{-3}$ )	Urinary	0 (0–0)	0 (0–2.57)	0 (0–0)	<b>0.043</b>
Psicose-meto-5TMS ( $\times 10^{-1}$ )	Urinary	1.64 (0.92–5.18)	2.74 (0.49–1.07)	1.41 (1.01–3.65)	0.530
Putrescine-4TMS ( $\times 10^{-1}$ )	Urinary	1.35 (0.94–1.92)	1.25 (0.64–1.93)	1.36 (0.97–1.93)	0.613

Pyridoxal-meto-2TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.892
Pyrogallol-3TMS ( $\times 10^{-1}$ )	Urinary	0.75 (0.28–3.24)	0.78 (0.32–11.28)	0.72 (0.27–3.04)	0.530
Pyruvic acid-meto-TMS ( $\times 10^{-1}$ )	Urinary	3.13 (2.10–3.73)	2.90 (1.62–3.89)	3.19 (2.17–3.70)	0.794
Quinolinic acid-2TMS ( $\times 10^{-1}$ )	Urinary	3.36 (2.47–5.31)	4.18 (2.30–6.91)	3.32 (2.36–4.24)	0.399
Ribitol-5TMS ( $\times 10^{-1}$ )	Urinary	0.80 (0.51–1.34)	1.02 (0.66–1.56)	0.66 (0.48–1.29)	0.350
Ribonic acid-5TMS	Urinary	1.45 (0.99–2.01)	1.70 (1.07–2.38)	1.35 (0.98–1.91)	0.203
Ribonolactone-3TMS ( $\times 10^{-2}$ )	Urinary	5.83 (3.42–8.61)	6.60 (4.05–9.89)	5.81 (3.37–8.49)	0.530
Ribose 5-phosphate-meto-5TMS ( $\times 10^{-3}$ )	Urinary	0 (0–1.28)	0 (0–8.05)	0 (0–0)	0.176
Ribose-meto-4TMS ( $\times 10^{-1}$ )	Urinary	0.87 (0.59–1.23)	0.91 (0.55–1.51)	0.83 (0.58–1.12)	0.399
Ribulose-meto-4TMS ( $\times 10^{-1}$ )	Urinary	1.62 (1.08–2.42)	2.23 (0.97–3.25)	1.54 (1.08–2.27)	0.530
Saccharopine-4TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.602
Sebacic acid-2TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.354
Serine-3TMS	Urinary	1.67 (1.06–2.78)	1.73 (1.46–3.64)	1.52 (0.91–2.39)	0.290
Sorbitol-6TMS ( $\times 10^{-1}$ )	Urinary	3.91 (2.82–5.49)	4.53 (3.23–7.23)	3.78 (2.73–4.84)	0.145
Sorbose-meto-5TMS ( $\times 10^{-2}$ )	Urinary	3.79 (1.90–7.94)	3.87 (1.89–12.82)	3.76 (1.95–7.09)	0.399
Spermidine-5TMS ( $\times 10^{-3}$ )	Urinary	0 (0–0)	0 (0–8.54)	0 (0–0)	0.688
Spermine-6TMS ( $\times 10^{-1}$ )	Urinary	1.02 (0.48–1.36)	1.04 (0.64–1.35)	1.01 (0.44–1.36)	0.613
Stearic acid-TMS	Urinary	2.55 (2.34–3.17)	2.45 (2.40–3.20)	2.58 (2.26–3.17)	0.939
Suberic acid-2TMS ( $\times 10^{-2}$ )	Urinary	0.46 (0–1.76)	0 (0–0.46)	0.88 (0–2.32)	0.101
Succinic acid-2TMS ( $\times 10^{-1}$ )	Urinary	0.91 (0.68–1.18)	0.95 (0.75–1.28)	0.91 (0.68–1.14)	0.635
Sucrose-8TMS	Urinary	0.18 (0.10–0.38)	1.08 (0.04–1.20)	0.18 (0.11–0.33)	0.250
Tagatose-meto-5TMS ( $\times 10^{-1}$ )	Urinary	0.38 (0.18–1.19)	0.93 (0.10–1.37)	0.36 (0.18–0.89)	0.334
Tartaric acid-4TMS	Urinary	0.14 (0.07–0.91)	0.12 (0.02–1.01)	0.15 (0.08–0.75)	0.635
Taurine-13C2-3TMS ( $\times 10^{-1}$ )	Urinary	0.59 (0.28–1.11)	0.49 (0.23–0.88)	0.67 (0.29–1.16)	0.550
Thiodiglycolic acid-2TMS ( $\times 10^{-3}$ )	Urinary	0 (0–0)	0 (0–6.60)	0 (0–0)	0.052
Threitol-4TMS ( $\times 10^{-1}$ )	Urinary	1.28 (0.67–1.95)	1.25 (0.53–2.51)	1.31 (0.73–1.87)	0.988
Threonic acid-4TMS	Urinary	1.54 (0.89–2.28)	2.04 (1.01–2.54)	1.46 (0.88–2.24)	0.350
Threonine-3TMS ( $\times 10^{-1}$ )	Urinary	3.17 (1.91–4.93)	3.56 (2.69–5.23)	3.14 (1.80–5.04)	0.434
Tiglylglycine-TMS	Urinary	0 (0–0)	0 (0–0)	0 (0–0)	0.892

Trehalose-8TMS ( $\times 10^{-2}$ )	Urinary	2.07 (0–7.97)	1.48 (0–16.58)	2.21 (1.05–6.80)	0.963
Triethanolamine-3TMS ( $\times 10^{-2}$ )	Urinary	0 (0–1.55)	0 (0–1.51)	0 (0–1.64)	0.956
Tryptophan-3TMS ( $\times 10^{-1}$ )	Urinary	1.36 (0.72–2.11)	1.47 (1.14–1.73)	1.25 (0.65–2.30)	0.890
Tyramine-3TMS ( $\times 10^{-1}$ )	Urinary	2.36 (1.69–3.80)	3.74 (1.94–7.25)	2.34 (1.63–3.61)	0.145
Tyrosine-3TMS	Urinary	3.10 (1.63–5.57)	3.92 (2.29–5.77)	2.97 (1.48–5.51)	0.319
Uracil-2TMS ( $\times 10^{-2}$ )	Urinary	0.17 (0–0.85)	0.59 (0–1.71)	0 (0–0.78)	0.232
Urea-2TMS	Urinary	200.3 (151.4–248.7)	172.1 (150.3–237.0)	201.0 (165.3–255.9)	0.702
Ureidopropionic acid-2TMS ( $\times 10^{-3}$ )	Urinary	0 (0–8.79)	8.46 (0–9.92)	0 (0–4.93)	0.254
Uric acid-4TMS	Urinary	4.43 (3.07–6.20)	4.48 (3.00–7.53)	4.37 (3.06–5.75)	0.771
Urocanic acid-2TMS ( $\times 10^{-1}$ )	Urinary	1.37 (1.01–2.07)	2.08 (1.03–2.54)	1.25 (0.99–1.69)	0.163
Valine-2TMS	Urinary	1.40 (0.77–1.80)	1.64 (1.11–1.91)	1.27 (0.75–1.80)	0.334
Vanilmandelic acid-3TMS ( $\times 10^{-1}$ )	Urinary	5.01 (2.59–5.90)	5.52 (2.29–8.37)	4.94 (2.76–5.71)	0.471
Xanthine-3TMS ( $\times 10^{-1}$ )	Urinary	0.54 (0.32–0.96)	0.54 (0.37–1.33)	0.55 (0.31–0.92)	0.771
Xanthosine-5TMS ( $\times 10^{-2}$ )	Urinary	0.86 (0–1.55)	1.08 (0.27–1.43)	0.82 (0–1.61)	0.518
Xylitol-5TMS ( $\times 10^{-1}$ )	Urinary	1.02 (0.65–1.65)	1.37 (0.64–2.22)	0.97 (0.64–1.54)	0.550
Xylose-meto-4TMS ( $\times 10^{-1}$ )	Urinary	1.17 (0.55–1.79)	1.20 (0.36–1.65)	1.16 (0.59–1.94)	0.510
Xylulose-meto-4TMS ( $\times 10^{-1}$ )	Urinary	1.97 (1.30–3.10)	3.05 (1.05–3.57)	1.87 (1.33–2.80)	0.550

Abbreviations: IQR, Interquartile range; arb.unit, arbitrary unit; AHU, asymptomatic hyperuricemia; Raw P values were calculated from Mann–Whitney U test comparing asymptomatic hyperuricemia group to all gout group (without the Benjamini-Hochberg adjustment).

**Table S2. Summary of multivariate and univariate analysis results among asymptomatic hyperuricemia, gout with SUA <9.0 mg/dL, and gout with SUA ≥9.0 mg/dL groups.**

Compound name [arb.unit]	Sample	VIP <sup>1</sup>	VIP <sup>2</sup>	Median (IQR: Q1-Q3)			Raw P <sup>3</sup>	Raw P <sup>4</sup>
				AHU	Gout (SUA <9.0 mg/dL)	Gout (SUA ≥9.0 mg/dL)		
<b>2-Isopropylmalic acid-3TMS</b>	<b>Plasma</b>			<b>1</b>	<b>1</b>	<b>1</b>	<b>Reference</b>	
1,5-Anhydro-glucitol-4TMS (×10 <sup>-2</sup> )	Plasma	1.509	1.621	0.86 (0.67–1.48)	0.60 (0–1.09)	0.53 (0–0.89)	0.163	0.073
1,6-Anhydroglucose-3TMS (×10 <sup>-2</sup> )	Plasma	0.556	0.115	0.63 (0–1.07)	0.83 (0–1.05)	0.75 (0–0.94)	0.85	0.994
1-Hexadecanol-TMS (×10 <sup>-2</sup> )	Plasma	0.349	0.454	2.46 (2.09–2.53)	2.14 (1.63–2.74)	1.87 (1.62–2.52)	0.99	0.413
2-Aminoadipic acid-3TMS (×10 <sup>-3</sup> )	Plasma	1.292	0.659	4.88 (0–8.35)	0 (0–5.35)	0 (0–14.40)	0.487	0.94
2-Aminobutyric acid-2TMS (×10 <sup>-2</sup> )	Plasma	0.919	0.571	4.02 (3.77–5.79)	4.46 (3.27–6.79)	4.04 (2.98–5.41)	0.942	0.793
2-Aminoethanol-3TMS (×10 <sup>-1</sup> )	Plasma	0.511	0.677	3.59 (2.96–4.29)	3.48 (3.04–4.14)	3.44 (2.84–3.99)	0.99	0.793
2-Aminoisobutyric acid-2TMS (×10 <sup>-2</sup> )	Plasma	0.682	0.853	6.83 (5.26–8.02)	6.70 (5.62–7.56)	6.30 (5.54–7.41)	0.998	0.968
2-Aminopimelic acid-3TMS (×10 <sup>-1</sup> )	Plasma	0.786	1.29	2.14 (1.97–2.48)	2.49 (2.21–)2.69	2.71 (2.33–2.90)	0.396	0.099
2-Deoxy-glucose-4TMS (×10 <sup>-1</sup> )	Plasma	1.171	0.705	1.01 (0.83–1.27)	1.13 (0.87–1.78)	1.16 (0.83–1.35)	0.497	0.793
2-Hydroxybutyric acid-2TMS (×10 <sup>-1</sup> )	Plasma	0.957	1.445	1.39 (1.09–2.02)	1.61 (1.43–2.05)	2.11 (1.56–2.37)	0.283	0.195
2-Hydroxyglutaric acid-3TMS (×10 <sup>-2</sup> )	Plasma	0.743	0.329	1.14 (1.07–1.60)	1.42 (0.92–1.84)	1.41 (0.96–1.64)	0.979	0.984
2-Hydroxyisobutyric acid-2TMS (×10 <sup>-2</sup> )	Plasma	0.495	1.025	0.93 (0.80–1.21)	1.05 (0.71–1.97)	1.17 (0.89–1.48)	0.942	0.348
2-Hydroxyisovaleric acid-2TMS (×10 <sup>-2</sup> )	Plasma	0.921	0.906	3.55 (3.25–4.31)	3.26 (2.24–7.18)	5.00 (2.92–6.23)	0.962	0.38
2-Ketobutyric acid-meto-TMS (×10 <sup>-2</sup> )	Plasma	0.776	1.338	2.14 (1.73–2.64)	2.45 (1.82–2.90)	2.77 (2.31–3.14)	0.532	0.141
2-Ketoglutaric acid-meto-2TMS (×10 <sup>-2</sup> )	Plasma	1.876	2.362	5.18 (4.61–5.85)	6.61 (5.66–8.14)	8.11 (7.05–9.14)	<b>0.027</b>	<b>&lt;0.001</b>
2-Ketoisocaproic acid-meto-TMS (×10 <sup>-1</sup> )	Plasma	0.543	0.914	1.22 (1.17–1.60)	1.33 (0.99–1.67)	1.42 (1.17–1.74)	0.998	0.716
2-Keto-isovaleric acid-meto-TMS (×10 <sup>-2</sup> )	Plasma	0.957	1.166	2.08 (1.86–2.43)	1.90 (1.47–2.48)	2.39 (2.12–2.87)	0.606	0.264
3-Aminoglutaric acid-2TMS (×10 <sup>-2</sup> )	Plasma	1.261	0.496	6.97 (0.34–9.39)	0 (0–7.94)	1.53 (0–9.97)	0.311	0.709
3-Aminoisobutyric acid-3TMS (×10 <sup>-3</sup> )	Plasma	1.217	1.481	0 (0–0)	0 (0–7.20)	3.17 (0–15.03)	0.297	0.103
3-Aminopropanoic acid-3TMS (×10 <sup>-2</sup> )	Plasma	0.841	0.933	3.96 (2.28–5.78)	3.22 (0–6.56)	4.13 (1.34–10.99)	0.99	0.864
3-Hydroxybutyric acid-2TMS (×10 <sup>-1</sup> )	Plasma	1.07	0.872	4.04 (2.67–5.06)	4.04 (3.35–7.70)	3.99 (3.35–7.70)	0.569	0.558
3-Hydroxyglutaric acid-3TMS (×10 <sup>-1</sup> )	Plasma	0.568	0.528	8.03 (7.85–8.20)	7.97 (7.80–8.19)	7.96 (7.80–8.19)	0.89	0.83
3-Hydroxyisobutyric acid-2TMS (×10 <sup>-1</sup> )	Plasma	1.064	1.043	1.84 (1.25–2.25)	1.68 (1.50–2.33)	2.21 (1.47–2.67)	0.86	0.195

3-Hydroxyisovaleric acid-2TMS ( $\times 10^{-2}$ )	Plasma	0.787	1.011	4.79 (3.42–5.29)	4.67 (3.74–5.36)	4.90 (4.34–5.34)	0.793	0.483
3-Hydroxypropionic acid-2TMS ( $\times 10^{-2}$ )	Plasma	1.491	0.208	6.45 (5.63–8.04)	7.87 (660–8.33)	6.78 (6.07–7.97)	0.235	0.968
3-Methyl-2-oxovaleric acid-meto-TMS ( $\times 10^{-1}$ )	Plasma	0.73	1.236	1.22 (0.96–1.40)	1.16 (0.94–1.64)	1.46 (1.07–1.67)	0.999	0.264
3-Phenyllactic acid-2TMS ( $\times 10^{-3}$ )	Plasma	1.003	1.061	0 (0–7.59)	5.25 (0–9.05)	6.06 (0–1.09)	0.557	0.299
4-Aminobutyric acid-3TMS	Plasma	0.685	0.682	0 (0–0)	0 (0–0)	0 (0–0)	0.905	0.878
4-Hydroxyphenyllactic acid-3TMS ( $\times 10^{-2}$ )	Plasma	1.042	1.242	5.09 (4.14–7.47)	6.65 (4.60–7.79)	7.25 (5.16–9.54)	0.532	0.195
4-Hydroxyphenylpyruvic acid-meto-2TMS	Plasma	0.704	0.646	0 (0–0)	0 (0–0)	0 (0–0)	0.719	0.706
4-Hydroxyproline-3TMS ( $\times 10^{-1}$ )	Plasma	1.266	0.33	3.15 (0.20–4.00)	0.80 (0.07–3.23)	1.06 (0.08–4.95)	0.336	0.923
5-Hydroxymethyl-2-furoic acid-2TMS	Plasma	1.259	0	0 (0–0)	0 (0–0)	0 (0–0)	0.719	0.999
5-Methoxytryptamine-2TMS ( $\times 10^{-2}$ )	Plasma	0.339	1.177	1.65 (0.34–2.91)	1.73 (0.47–3.32)	1.32 (0.95–1.69)	0.998	0.793
5-Oxoproline-2TMS	Plasma	1.658	1.541	7.77 (6.71–8.75)	6.86 (5.90–7.71)	6.86 (5.22–7.75)	0.193	0.141
Acetoacetic acid-meto-TMS	Plasma	0.993	0.803	0 (0–0)	0 (0–0)	0 (0–0)	0.483	0.706
Acetylglycine-TMS	Plasma	0.948	0.894	0 (0–0)	0 (0–0)	0 (0–0)	0.483	0.463
Aconitic acid-3TMS ( $\times 10^{-3}$ )	Plasma	1.173	1.789	0 (0–0)	0 (0–0)	0 (0–9.43)	0.325	<b>0.047</b>
Adipic acid-2TMS ( $\times 10^{-3}$ )	Plasma	0.526	0.377	9.25 (2.48–12.48)	8.51 (2.89–14.80)	6.80 (4.28–9.80)	0.917	0.923
Alanine-2TMS	Plasma	0.817	0.488	24.4 (21.1–27.5)	22.6 (20.1–27.4)	25.2 (19.4–28.3)	0.644	0.999
Allose-meto-5TMS ( $\times 10^{-2}$ )	Plasma	1.224	1.174	7.50 (5.78–9.90)	9.47 (6.30–11.18)	8.77 (6.61–11.70)	0.497	0.413
Arabitol-5TMS ( $\times 10^{-2}$ )	Plasma	0.775	0.785	0 (0–0.88)	0.53 (0–1.08)	0.63 (0–1.37)	0.597	0.473
Arachidonic acid-TMS ( $\times 10^{-1}$ )	Plasma	1.384	2.285	0.85 (0.73–1.02)	0.76 (0.52–0.87)	0.56 (0.39–0.76)	0.235	<b>0.007</b>
Arginine-3TMS ( $\times 10^{-2}$ )	Plasma	0.957	0.327	2.19 (1.12–3.00)	1.83 (0–3.21)	1.90 (0.62–4.15)	0.791	0.948
Asparagine-3TMS ( $\times 10^{-2}$ )	Plasma	1.286	0.548	6.38 (0–7.56)	0.67 (0–5.61)	1.65 (0–5.34)	0.5	0.781
Aspartic acid-3TMS ( $\times 10^{-2}$ )	Plasma	1.282	0.546	6.46 (0–8.76)	0 (0–7.48)	1.23 (0–8.66)	0.378	0.785
Azelaic acid-2TMS	Plasma	0.696	0.772	0 (0–0)	0 (0–0)	0 (0–0)	0.999	0.866
Benzoic acid-TMS ( $\times 10^{-1}$ )	Plasma	1.096	0.62	5.40 (4.68–6.27)	5.91 (4.91–7.50)	5.27 (4.83–6.35)	0.428	0.968
Caproic acid-TMS ( $\times 10^{-1}$ )	Plasma	0.51	1.696	1.30 (1.07–1.41)	1.28 (1.07–1.51)	1.09 (0.71–1.21)	0.962	0.087
Cholesterol-TMS ( $\times 10^{-2}$ )	Plasma	1.412	0.645	1.30 (0.79–1.51)	0.86 (0–1.14)	0.97 (0.81–1.12)	0.18	0.539
Citramalic acid-3TMS ( $\times 10^{-2}$ )	Plasma	0.661	0.363	0.94 (0–1.21)	0.76 (0–0.98)	0.64 (0–1.15)	0.633	0.822
Citric acid-4TMS ( $\times 10^{-1}$ )	Plasma	0.529	1.09	3.16 (2.94–3.79)	3.51 (3.17–3.86)	3.94 (3.32–4.39)	0.86	0.264
Citrulline-3TMS	Plasma	0	0.646	0 (0–0)	0 (0–0)	0 (0–0)	0.999	0.706

Creatinine-3TMS ( $\times 10^{-3}$ )	Plasma	0.658	0.62	0 (0–6.63)	0 (0–2.46)	0 (0–7.70)	0.784	0.898
Cystamine-nTMS	Plasma	0	0.645	0 (0–0)	0 (0–0)	0 (0–0)	0.999	0.706
Cysteine-3TMS ( $\times 10^{-2}$ )	Plasma	1.693	1.054	7.64 (0.31–11.68)	1.70 (0–5.88)	2.14 (0–8.56)	0.147	0.44
Cystine-4TMS ( $\times 10^{-2}$ )	Plasma	1.387	1.434	2.58 (1.62–3.01)	3.40 (2.26–4.32)	3.16 (2.58–5.31)	0.157	0.141
Decanoic acid-TMS ( $\times 10^{-2}$ )	Plasma	0.616	0.335	6.66 (6.02–7.09)	6.75 (5.76–7.38)	6.24 (5.12–8.14)	0.918	0.793
Docosahexaenoic acid-TMS ( $\times 10^{-2}$ )	Plasma	1.612	0.968	0.55 (0–1.45)	1.55 (0.59–2.17)	1.06 (0.19–1.70)	0.134	0.473
Eicosapentaenoic acid-TMS ( $\times 10^{-2}$ )	Plasma	1.646	2.4	9.31 (7.38–9.53)	7.51 (5.47–8.92)	5.70 (4.35–7.58)	0.175	<b>0.008</b>
Elaidic acid-TMS ( $\times 10^{-2}$ )	Plasma	1.186	1.175	4.99 (3.78–6.12)	6.10 (4.94–7.98)	6.81 (5.02–9.88)	0.127	0.077
Fructose-meto-5TMS ( $\times 10^{-2}$ )	Plasma	1.016	1.532	2.36 (1.81–5.55)	2.36 (1.36–3.36)	1.48 (1.12–2.35)	0.624	0.087
Fumaric acid-2TMS ( $\times 10^{-2}$ )	Plasma	0.355	0.833	1.82 (1.50–2.27)	2.02 (1.87–2.48)	2.00 (1.71–2.49)	0.213	0.38
Galacturonic acid-meto-5TMS ( $\times 10^{-2}$ )	Plasma	0.735	0.91	0 (0–0.74)	0 (0–0)	0.25 (0–1.37)	0.86	0.421
Glucaric acid-6TMS ( $\times 10^{-2}$ )	Plasma	0.838	1.278	0.91 (0.32–1.13)	1.00 (0.60–1.34)	1.14 (0.91–2.00)	0.567	0.124
Gluconic acid-6TMS ( $\times 10^{-2}$ )	Plasma	0.897	0.911	3.58 (2.80–4.27)	3.09 (2.65–3.94)	3.86 (2.87–4.71)	0.682	0.755
Glucosamine-5TMS ( $\times 10^{-2}$ )	Plasma	0.347	1.358	1.85 (1.60–2.23)	1.90 (1.50–2.57)	1.66 (0.16–2.08)	0.918	0.446
Glucose-meto-5TMS	Plasma	2.01	1.85	5.88 (4.93–6.75)	7.92 (6.49–9.31)	7.05 (6.24–8.95)	<b>0.024</b>	<b>0.029</b>
Glucuronic acid-meto-5TMS ( $\times 10^{-2}$ )	Plasma	0.549	1.195	1.73 (1.10–2.16)	1.88 (1.25–2.69)	2.25 (1.84–3.07)	0.756	0.157
Glutamic acid-3TMS ( $\times 10^{-1}$ )	Plasma	1.392	0.339	4.59 (0.58–7.09)	0.49 (0.09–4.90)	2.82 (0.31–5.84)	0.447	0.113
Glutamine-3TMS ( $\times 10^{-1}$ )	Plasma	1.471	0.372	7.33 (1.71–9.59)	3.08 (0.93–7.98)	4.82 (1.42–9.71)	0.337	0.793
Glutaric acid-2TMS ( $\times 10^{-2}$ )	Plasma	0.759	0.072	1.65 (1.35–1.76)	1.64 (1.25–2.26)	1.45 (1.01–2.26)	0.81	0.989
Glyceric acid-3TMS ( $\times 10^{-1}$ )	Plasma	0.955	0.733	1.28 (1.21–1.68)	1.28 (1.14–1.56)	1.24 (1.10–1.56)	0.962	0.558
Glycerol 3-phosphate-4TMS ( $\times 10^{-2}$ )	Plasma	1.154	1.415	0 (0–0.94)	1.01 (0–1.27)	0.90 (0.16–1.35)	0.322	0.177
Glycerol-3TMS ( $\times 10^{-1}$ )	Plasma	1.15	0.988	1.06 (0.79–1.23)	1.19 (0.86–1.47)	0.82 (0.76–1.12)	0.497	0.483
Glycine-3TMS	Plasma	1.404	1.086	5.92 (4.09–7.49)	4.86 (3.13–5.77)	4.10 (3.04–5.31)	0.309	0.176
Glycolic acid-2TMS ( $\times 10^{-1}$ )	Plasma	0.425	0.457	2.19 (1.91–2.45)	2.12 (1.94–2.48)	2.22 (1.84–2.29)	0.942	0.968
Glyoxylic acid-meto-TMS ( $\times 10^{-1}$ )	Plasma	1.162	0.358	5.06 (4.73–5.31)	5.11 (4.66–6.04)	4.75 (4.19–5.40)	0.719	0.755
Histidine-3TMS ( $\times 10^{-1}$ )	Plasma	1.067	0.461	1.64 (0.93–2.91)	1.13 (0.26–2.32)	1.50 (0.56–3.94)	0.396	0.83
Homocysteine-3TMS	Plasma	0	0.803	0 (0–0)	0 (0–0)	0 (0–0)	0.999	0.706
Hydroxylamine-3TMS ( $\times 10^{-1}$ )	Plasma	1.329	0.681	6.24 (4.48–6.86)	7.61 (5.60–9.967)	6.62 (5.54–8.18)	0.175	0.558
Hypotaurine-3TMS ( $\times 10^{-2}$ )	Plasma	0.301	0.641	0.84 (0–1.11)	0.49 (0–1.56)	1.00 (0–1.74)	0.999	0.584



Hypoxanthine-2TMS ( $\times 10^{-2}$ )	Plasma	1.003	0.209	0 (0–1.18)	0 (0–0.39)	0 (0–1.09)	0.463	0.979
Indol-3-acetic acid-2TMS ( $\times 10^{-2}$ )	Plasma	1.378	0.876	3.89 (3.10–5.10)	3.15 (2.09–3.48)	3.24 (1.53–3.76)	0.175	0.217
Inositol-6TMS ( $\times 10^{-1}$ )	Plasma	1.335	0.329	1.31 (0.99–1.75)	1.55 (1.20–2.16)	1.31 (1.07–1.66)	0.235	0.984
Isocitric acid-4TMS ( $\times 10^{-2}$ )	Plasma	1.284	1.678	1.89 (1.62–2.13)	2.18 (2.00–2.77)	2.58 (2.18–3.09)	0.127	<b>0.018</b>
Isoleucine-2TMS	Plasma	1.127	0.189	3.39 (2.38–3.53)	2.87 (1.36–3.68)	2.82 (1.40–4.04)	0.606	0.637
Kynurenine-3TMS ( $\times 10^{-3}$ )	Plasma	0.464	0.765	0 (0–5.36)	0 (0–1.98)	0 (0–8.55)	0.870	0.862
Lactic acid-2TMS	Plasma	1.725	1.519	6.28 (5.63–7.71)	7.86 (6.44–9.34)	8.11 (6.87–13.99)	0.079	<b>0.045</b>
Lactose-meto-8TMS	Plasma	0	0.6	0 (0–0)	0 (0–0)	0 (0–0)	0.999	0.706
Lauric acid-TMS ( $\times 10^{-1}$ )	Plasma	0.307	1.069	0.99 (0.89–1.03)	0.84 (0.71–1.02)	0.79 (0.64–1.11)	0.287	0.319
Leucine-2TMS	Plasma	1.48	0.393	6.85 (4.59–7.24)	5.66 (2.70–6.28)	5.10 (2.61–6.67)	0.157	0.264
Linoleic acid-TMS ( $\times 10^{-1}$ )	Plasma	0.63	0.862	1.44 (1.11–1.68)	1.53 (1.19–1.91)	1.54 (1.34–1.99)	0.86	0.598
Lysine-4TMS	Plasma	1.499	0.256	0.59 (0.51–0.97)	0.53 (0.30–0.77)	0.64 (0.37–1.02)	0.283	0.895
Lyxose-meto-4TMS	Plasma	0.704	0	0 (0–0)	0 (0–0)	0 (0–0)	0.719	0.999
Maleic acid-2TMS	Plasma	1.041	1.142	0 (0–0)	0 (0–0)	0 (0–0)	0.947	0.999
Malic acid-3TMS ( $\times 10^{-3}$ )	Plasma	1.506	1.451	4.62 (0–5.33)	0 (0–6.45)	6.46 (4.25–7.93)	0.855	0.061
Mannitol-6TMS	Plasma	1.776	1.294	0.94 (0.78–1.03)	1.14 (0.97–1.35)	1.01 (0.88–1.31)	0.036	0.24
Mannose-meto-5TMS ( $\times 10^{-1}$ )	Plasma	1.523	1.18	0.93 (0.85–1.37)	1.33 (1.06–1.59)	1.19 (0.92–1.62)	0.127	0.38
Margaric acid-TMS ( $\times 10^{-2}$ )	Plasma	0.728	0.446	4.39 (3.78–5.08)	4.01 (3.36–4.95)	4.04 (3.60–4.86)	0.682	0.716
meso-Erythritol-4TMS ( $\times 10^{-3}$ )	Plasma	1.157	0.821	0 (0–0)	0 (0–2.38)	0 (0–0)	0.216	0.463
Methionine-2TMS ( $\times 10^{-2}$ )	Plasma	1.127	0.384	2.39 (0–3.73)	0 (0–2.46)	0 (0–2.80)	0.544	0.67
Myristic acid-TMS ( $\times 10^{-1}$ )	Plasma	0.973	0.715	1.70 (1.44–1.85)	1.50 (1.20–1.87)	1.48 (1.14–1.75)	0.428	0.348
N6-Acetyllysine-2TMS	Plasma	0.69	0	0 (0–0)	0 (0–0)	0 (0–0)	0.719	0.999
N-Acetylglutamine-3TMS	Plasma	0.805	1.018	0 (0–0)	0 (0–0)	0 (0–0)	0.719	0.304
Niacinamide-TMS	Plasma	0	0.682	0 (0–0)	0 (0–0)	0 (0–0)	0.999	0.706
Nicotinic acid-TMS	Plasma	1.298	0.37	0 (0–0)	0 (0–0)	0 (0–0)	0.309	0.878
Nonanoic acid-TMS ( $\times 10^{-1}$ )	Plasma	1.669	3.1	6.84 (6.27–7.29)	4.62 (3.21–7.16)	2.96 (2.56–3.31)	0.193	<b>&lt;0.001</b>
Octadecanol-TMS ( $\times 10^{-2}$ )	Plasma	1.182	0.986	7.53 (7.22–8.30)	8.37 (6.88–9.44)	8.04 (6.93–9.20)	0.235	0.598
Octanoic acid-TMS ( $\times 10^{-2}$ )	Plasma	0.227	1.27	6.29 (5.78–6.65)	6.35 (5.58–6.67)	5.33 (3.86–6.25)	0.999	0.099
Oleamide-TMS ( $\times 10^{-1}$ )	Plasma	0.597	1.177	2.74 (2.08–3.88)	2.78 (2.32–5.09)	2.53 (2.02–3.24)	0.86	0.558

Oleic acid-TMS ( $\times 10^{-1}$ )	Plasma	0.64	1.336	4.17 (3.06–5.09)	3.92 (3.53–5.55)	5.18 (4.04–6.70)	0.793	0.217
O-Phosphoethanolamine-3TMS ( $\times 10^{-3}$ )	Plasma	1.267	0.715	0 (0–0)	0 (0–0)	0 (0–8.82)	0.309	0.513
Ornithine-4TMS	Plasma	1.055	0.188	1.61 (0.75–1.85)	1.33 (0.51–1.70)	1.33 (0.55–2.13)	0.606	0.923
Oxalic acid-2TMS	Plasma	0.574	1.433	3.94 (3.60–4.11)	3.81 (3.33–4.12)	3.14 (2.80–3.79)	0.942	0.087
Palmitic acid-TMS	Plasma	0.839	0.625	5.32 (4.38–5.64)	4.08 (4.00–5.48)	4.64 (3.93–5.70)	0.606	0.867
Palmitoleic acid-TMS ( $\times 10^{-2}$ )	Plasma	0.943	1.508	2.55 (2.05–4.64)	3.88 (2.52–5.64)	4.92 (3.37–7.35)	0.462	0.077
ParaXanthine-TMS	Plasma	0	0.821	0 (0–0)	0 (0–0)	0 (0–0)	0.999	0.463
Phenylacetic acid-TMS	Plasma	0.789	1.106	0 (0–0)	0 (0–0)	0 (0–0)	0.719	0.304
Phenylalanine-2TMS	Plasma	1.125	0.516	1.75 (0.09–2.57)	0.11 (0.06–2.25)	0.47 (0.07–2.32)	0.428	0.793
Phosphoric acid-3TMS	Plasma	1.712	1.774	23.9 (20.6–27.6)	20.3 (19.7–24.4)	19.9 (17.2–22.0)	0.141	0.039
Proline-2TMS	Plasma	1.074	0.455	2.64 (1.92–4.42)	2.07 (1.22–3.34)	1.73 (1.14–5.40)	0.235	0.637
Psicose-meto-5TMS ( $\times 10^{-2}$ )	Plasma	1.105	1.614	3.16 (1.79–5.00)	2.09 (0.36–4.23)	1.72 (1.25–2.36)	0.365	0.087
Putrescine-4TMS ( $\times 10^{-2}$ )	Plasma	0.994	0.419	0 (0–1.71)	1.48 (0–1.72)	0 (0–1.44)	0.842	0.979
Pyrogallol-3TMS ( $\times 10^{-3}$ )	Plasma	1.69	1.507	0 (0–5.30)	0 (0–0)	0 (0–0)	0.093	0.106
Pyruvic acid-meto-TMS	Plasma	1.036	1.919	0.60 (0.54–0.67)	0.66 (0.46–0.80)	0.79 (0.61–1.03)	0.462	<b>0.021</b>
Ribitol-5TMS ( $\times 10^{-3}$ )	Plasma	0.817	0.677	0 (0–6.82)	4.87 (0–8.59)	6.31 (0–9.96)	0.325	0.33
Ribonic acid-5TMS ( $\times 10^{-2}$ )	Plasma	0.671	0.652	0 (0–2.04)	2.06 (0–2.75)	2.23 (0.34–2.85)	0.446	0.25
Serine-3TMS ( $\times 10^{-1}$ )	Plasma	1.531	0.836	9.76 (4.59–11.24)	4.24 (1.81–9.10)	4.11 (1.65–9.03)	0.175	0.24
Sorbitol-6TMS ( $\times 10^{-1}$ )	Plasma	0.936	1.938	1.95 (0.81–2.40)	1.78 (1.08–2.09)	1.13 (0.79–1.37)	0.942	0.195
Sorbose-meto-5TMS ( $\times 10^{-2}$ )	Plasma	0.976	1.771	2.14 (0.61–4.31)	1.33 (0–2.15)	0 (0–1.69)	0.377	<b>0.025</b>
Stearic acid-TMS	Plasma	1.074	0.173	3.70 (3.34–4.06)	3.07 (2.86–3.87)	3.30 (2.86–3.70)	0.283	0.319
Succinic acid-2TMS ( $\times 10^{-1}$ )	Plasma	0.554	0.963	0.86 (0.83–0.97)	0.94 (0.81–1.07)	0.85 (0.70–0.92)	0.827	0.38
Sucrose-8TMS ( $\times 10^{-2}$ )	Plasma	1.934	1.319	1.69 (0–6.92)	0 (0–0.32)	0 (0–1.14)	<b>0.044</b>	0.194
Tagatose-meto-5TMS ( $\times 10^{-2}$ )	Plasma	1.004	1.557	2.12 (0–5.66)	1.39 (0.35–2.26)	0 (0–1.45)	0.563	0.173
Tartaric acid-4TMS ( $\times 10^{-3}$ )	Plasma	1.141	0.814	0 (0–0)	0 (0–2.76)	0 (0–0)	0.216	0.463
Taurine-3TMS ( $\times 10^{-2}$ )	Plasma	1.232	0.819	1.16 (0.50–2.54)	0.98 (0–1.79)	1.88 (1.04–3.42)	0.671	0.412
Threitol-4TMS	Plasma	0.789	0.646	0 (0–0)	0 (0–0)	0 (0–0)	0.719	0.706
Threonic acid-4TMS ( $\times 10^{-2}$ )	Plasma	0.744	0.45	3.63 (2.60–4.46)	4.06 (3.06–4.76)	2.99 (2.31–4.30)	0.682	0.755
Threonine-3TMS ( $\times 10^{-1}$ )	Plasma	1.05	0.576	6.18 (3.43–6.73)	3.42 (1.40–6.35)	2.99 (1.34–7.37)	0.366	0.38

Triethanolamine-3TMS ( $\times 10^{-2}$ )	Plasma	0.916	0.879	1.58 (1.10–2.90)	1.66 (1.46–2.24)	1.51 (0.96–1.89)	0.942	0.598
Tryptophan-3TMS	Plasma	1.3	1.564	1.58 (1.19–2.20)	1.26 (0.85–1.74)	1.10 (0.81–1.57)	0.235	0.087
Tyramine-3TMS	Plasma	1.522	0.234	1.27 (0.97–1.91)	1.10 (0.62–1.47)	1.29 (0.72–1.95)	0.337	0.923
Tyrosine-3TMS	Plasma	1.044	0.274	3.44 (2.98–4.46)	2.74 (2.22–4.33)	3.25 (2.14–5.08)	0.682	0.83
Urea-2TMS	Plasma	0.63	0.246	10.81 (8.43–11.52)	8.95 (8.28–12.27)	8.90 (6.87–13.30)	0.756	0.677
Uric acid-4TMS	Plasma	0.888	2.221	1.46 (1.39–1.78)	1.53 (1.38–1.56)	1.92 (1.81–2.32)	0.942	<b>0.009</b>
Valine-2TMS	Plasma	1.316	0.688	15.5 (13.6–16.6)	13.8 (10.9–15.7)	12.1 (9.9–17.4)	0.309	0.348
Xanthine-3TMS	Plasma	1.047	0	0 (0–0)	0 (0–0)	0 (0–0)	0.719	0.999
Xylitol-5TMS	Plasma	1.047	0	0 (0–0)	0 (0–0)	0 (0–0)	0.719	0.999
Xylose-meto-4TMS	Plasma	0.898	0	0 (0–0)	0 (0–0)	0 (0–0)	0.483	0.999
<b>2-Isopropylmalic acid-3TMS</b>	<b>Urinary</b>			<b>1</b>	<b>1</b>	<b>1</b>	<b>Reference</b>	
1,6-Anhydroglucose-3TMS ( $\times 10^{-1}$ )	Urinary	0.476	0.681	2.17 (0.59–5.83)	3.46 (2.14–4.18)	2.27 (1.05–3.07)	0.681	0.829
1-Hexadecanol-TMS ( $\times 10^{-1}$ )	Urinary	0.502	1.496	1.93 (1.56–2.27)	1.89 (1.61–2.39)	1.56 (1.33–1.87)	0.999	0.111
2-Aminobutyric acid-2TMS ( $\times 10^{-2}$ )	Urinary	1.073	0.621	1.28 (1.13–1.59)	1.32 (0.69–2.79)	0.95 (0.46–1.60)	0.999	0.157
2-Aminoethanol-3TMS	Urinary	0.658	0.973	14.79 (8.73–20.02)	11.55 (9.36–17.01)	9.59 (5.35–18.19)	0.89	0.598
2-Aminopimelic acid-3TMS	Urinary	0.67	0.934	10.16 (5.04–15.38)	10.02 (7.29–14.78)	7.78 (5.53–9.33)	0.99	0.677
2-Hydroxybutyric acid-2TMS	Urinary	1.047	0.721	0 (0–0)	0 (0–0)	0 (0–0)	0.719	0.463
2-Hydroxyglutaric acid-3TMS ( $\times 10^{-1}$ )	Urinary	0.531	0.65	5.90 (1.94–8.78)	4.30 (3.31–9.28)	4.57 (2.87–7.35)	0.998	0.793
2-Hydroxyhippuric acid-2TMS ( $\times 10^{-2}$ )	Urinary	0.344	0.75	4.72 (1.98–11.03)	3.42 (1.60–6.32)	2.68 (1.29–25.35)	0.625	0.676
2-Hydroxyisobutyric acid-2TMS ( $\times 10^{-1}$ )	Urinary	0.98	0.574	1.28 (0.67–2.07)	1.08 (0.86–1.62)	1.41 (0.93–2.27)	0.942	0.793
2-Hydroxyisovaleric acid-2TMS	Urinary	1.109	0.955	0 (0–0)	0 (0–0)	0 (0–0)	0.483	0.304
2-Ketoadipic acid-oxime-3TMS	Urinary	1.047	0.598	0 (0–0)	0 (0–0)	0 (0–0)	0.719	0.706
2-Ketobutyric acid-meto-TMS ( $\times 10^{-2}$ )	Urinary	1.321	1.059	1.38 (1.13–1.79)	1.64 (1.27–1.96)	1.60 (1.30–1.88)	0.309	0.413
2-Ketoglutaric acid-meto-2TMS	Urinary	0.675	0.627	1.17 (0.29–1.54)	0.97 (0.58–1.30)	0.77 (0.56–1.02)	0.918	0.923
2-Ketoisocaproic acid-meto-TMS ( $\times 10^{-3}$ )	Urinary	0.438	0.607	6.61 (0–9.61)	0 (0–12.93)	0 (0–8.77)	0.989	0.67
2-Keto-isovaleric acid-meto-TMS	Urinary	1.065	0.803	0 (0–0)	0 (0–0)	0 (0–0)	0.483	0.706
2-Methyl-3-hydroxybutyric acid-2TMS ( $\times 10^{-3}$ )	Urinary	0.728	1.103	0 (0–0)	0 (0–0)	0 (0–7.75)	0.947	0.295
2-Phosphoglyceric acid -4TMS ( $\times 10^{-3}$ )	Urinary	1.568	0.981	0 (0–6.60)	0 (0–0)	0 (0–0)	0.254	0.419
3-Aminoglutaric acid-2TMS ( $\times 10^{-2}$ )	Urinary	1.07	1.89	7.64 (5.35–10.38)	5.41 (4.08–10.96)	3.33 (2.45–6.01)	0.682	<b>0.039</b>
3-Aminoisobutyric acid-3TMS ( $\times 10^{-1}$ )	Urinary	0.818	0.552	1.31 (0.79–15.74)	5.20 (0.86–16.84)	1.18 (0.49–6.01)	0.756	0.716

3-Aminopropanoic acid-3TMS ( $\times 10^{-1}$ )	Urinary	1.052	0.977	0.80 (0.32–1.18)	1.17 (0.36–3.20)	0.82 (0.54–2.34)	0.606	0.793
3-Hydroxy-3-methylglutaric acid-3TMS ( $\times 10^{-2}$ )	Urinary	0.713	0.826	6.68 (2.04–7.69)	4.60 (3.56–7.49)	5.29 (4.66–7.20)	0.998	0.948
3-Hydroxyanthranilic acid-3TMS ( $\times 10^{-3}$ )	Urinary	0.795	0.917	0 (0–2.72)	0 (0–4.98)	0 (0–1.36)	0.948	0.443
3-Hydroxybutyric acid-2TMS ( $\times 10^{-1}$ )	Urinary	1.254	1.403	1.75 (1.35–2.15)	1.98 (1.61–2.36)	2.06 (1.64–2.57)	0.309	0.141
3-Hydroxyglutaric acid-3TMS ( $\times 10^{-1}$ )	Urinary	0.605	1.347	8.12 (7.93–8.23)	8.22 (7.55–8.50)	7.68 (7.43–8.01)	0.999	<b>0.045</b>
3-Hydroxyisobutyric acid-2TMS ( $\times 10^{-1}$ )	Urinary	0.687	0.961	1.79 (1.01–2.05)	1.38 (1.21–1.89)	1.76 (1.26–2.99)	0.99	0.637
3-Hydroxyisovaleric acid-2TMS ( $\times 10^{-1}$ )	Urinary	0.834	0.94	4.64 (2.80–5.33)	4.02 (3.05–6.59)	4.14 (3.25–7.86)	0.942	0.83
3-Hydroxyphenylacetic acid-2TMS ( $\times 10^{-2}$ )	Urinary	0.961	0.168	0 (0–1.15)	0 (0–0.71)	0 (0–1.65)	0.72	0.979
3-Hydroxypropionic acid-2TMS ( $\times 10^{-1}$ )	Urinary	0.443	0.58	1.31 (0.77–2.25)	1.10 (0.88–1.97)	1.30 (0.85–1.81)	0.99	0.968
3-Methoxy-4-hydroxybenzoic acid-2TMS ( $\times 10^{-2}$ )	Urinary	1.731	1.065	0.77 (0–1.08)	1.57 (0.69–2.37)	0.94 (0–1.84)	<b>0.049</b>	0.665
3-Methyl-2-oxovaleric acid-meto-TMS ( $\times 10^{-2}$ )	Urinary	0.699	0.92	0.88 (0.64–1.70)	1.47 (0–2.10)	1.53 (0.86–2.11)	0.874	0.637
3-Methyladipic acid-2TMS ( $\times 10^{-2}$ )	Urinary	0.86	0.989	0 (0–3.04)	2.82 (0.86–5.13)	3.00 (0–8.24)	0.245	0.503
3-Methylglutaric acid-2TMS ( $\times 10^{-2}$ )	Urinary	0.5	0.661	1.48 (1.15–2.23)	1.55 (0.47–2.89)	1.82 (0.29–3.07)	0.99	0.947
3-Phenyllactic acid-2TMS ( $\times 10^{-2}$ )	Urinary	1.038	0.989	0 (0–0.56)	0 (0–2.10)	1.04 (0–1.51)	0.627	0.184
3-Phosphoglyceric acid-4TMS ( $\times 10^{-3}$ )	Urinary	1.476	0.906	7.35 (0–18.50)	0 (0–9.49)	3.24 (0–22.85)	0.407	0.731
3-Sulfinioalanine-3TMS ( $\times 10^{-3}$ )	Urinary	0.971	0.653	0 (0–4.51)	0 (0–3.98)	0 (0–0)	0.728	0.432
4-Aminobutyric acid-3TMS ( $\times 10^{-2}$ )	Urinary	1.198	1.854	7.35 (3.82–9.97)	4.27 (0.81–6.99)	1.80 (0–5.99)	0.307	0.051
4-Hydroxybenzoic acid-2TMS ( $\times 10^{-2}$ )	Urinary	0.822	0.523	2.70 (1.72–3.99)	3.29 (2.09–4.43)	2.95 (1.25–3.52)	0.682	0.83
4-Hydroxyphenylacetic acid-2TMS ( $\times 10^{-1}$ )	Urinary	0.99	0.382	0.93 (0.29–1.51)	1.10 (0.51–2.92)	0.61 (0.34–1.37)	0.497	0.978
4-Hydroxyphenyllactic acid-3TMS ( $\times 10^{-1}$ )	Urinary	0.554	0.636	1.32 (0.41–1.78)	1.23 (0.87–1.86)	1.91 (0.68–2.79)	0.942	0.558
4-Hydroxyproline-3TMS ( $\times 10^{-2}$ )	Urinary	0.772	0.514	0 (0–9.19)	0 (0–5.17)	0 (0–5.39)	0.988	0.992
5-Aminolevulinic acid-meto-3TMS ( $\times 10^{-2}$ )	Urinary	0.783	1.713	1.72 (1.14–2.39)	1.39 (1.03–1.92)	0.86 (0–1.29)	0.701	<b>0.044</b>
5-Aminovaleric acid-3TMS ( $\times 10^{-1}$ )	Urinary	0.441	1.095	0.76 (0.52–1.33)	0.87 (0.66–1.48)	0.59 (0.35–1.02)	0.918	0.38
5-Hydroxymethyl-2-furoic acid-2TMS ( $\times 10^{-1}$ )	Urinary	1.157	0.402	1.84 (0.42–2.66)	1.68 (0.56–3.54)	0.89 (0.71–1.66)	0.89	0.637
5-Oxoproline-2TMS	Urinary	0.813	0.534	10.09 (6.18–11.52)	8.51 (7.41–12.13)	8.44 (7.47–10.96)	0.918	0.948
7-Methylguanine-2TMS ( $\times 10^{-1}$ )	Urinary	1.088	0.893	4.00 (2.32–8.43)	3.71 (2.37–5.69)	2.44 (1.86–4.27)	0.569	0.319
Acetoacetic acid-meto-TMS	Urinary	0	0.803	0 (0–0)	0 (0–0)	0 (0–0)	0.999	0.706
Acetylglycine-TMS	Urinary	1.011	0.598	0 (0–0)	0 (0–0)	0 (0–0)	0.483	0.706
Aconitic acid-3TMS	Urinary	0.62	1.08	2.63 (0.89–2.92)	1.97 (1.06–3.05)	1.20 (0.91–2.04)	0.99	0.319

Adenine-2TMS ( $\times 10^{-1}$ )	Urinary	1.266	1.353	1.72 (1.17–4.07)	1.63 (1.31–2.42)	1.54 (1.04–2.04)	0.86	0.413
Adenosine-4TMS ( $\times 10^{-1}$ )	Urinary	1.109	1.77	1.31 (0.78–2.39)	1.00 (0.73–1.64)	0.71 (0.50–0.97)	0.569	0.077
Adipic acid-2TMS ( $\times 10^{-2}$ )	Urinary	0.466	1.104	1.32 (0.78–1.97)	1.60 (1.05–2.68)	2.44 (1.18–4.75)	0.606	0.157
Alanine-2TMS	Urinary	0.942	0.946	12.72 (8.70–13.82)	12.08 (6.50–21.25)	9.17 (5.82–12.13)	0.99	0.38
Allantoin-3TMS ( $\times 10^{-2}$ )	Urinary	0.753	0.786	4.74 (0.84–1.11)	4.35 (2.94–7.77)	3.39 (0.22–9.52)	0.962	0.894
Allose-meto-5TMS ( $\times 10^{-2}$ )	Urinary	1.108	1.369	7.43 (4.22–24.13)	6.72 (5.22–10.85)	6.60 (3.89–8.29)	0.719	0.483
Arabinose-meto-4TMS ( $\times 10^{-1}$ )	Urinary	0.483	1.037	3.98 (2.15–6.26)	4.12 (2.37–5.41)	2.83 (2.35–3.44)	0.999	0.264
Arabitol-5TMS ( $\times 10^{-1}$ )	Urinary	0.832	0.603	8.37 (4.25–8.74)	6.59 (4.37–11.06)	5.70 (4.07–10.02)	0.998	0.968
Arachidonic acid-TMS	Urinary	0	0.671	0 (0–0)	0 (0–0)	0 (0–0)	0.999	0.706
Arginine-3TMS ( $\times 10^{-1}$ )	Urinary	0.817	1.223	1.51 (1.14–2.33)	1.15 (0.60–2.11)	0.54 (0.17–1.43)	0.644	0.111
Ascorbic acid-4TMS	Urinary	0.979	1.068	0 (0–0)	0 (0–0)	0 (0–0)	0.808	0.331
Asparagine-3TMS ( $\times 10^{-1}$ )	Urinary	0.815	0.786	1.14 (0–3.21)	1.38 (0.83–3.82)	1.21 (0.74–2.87)	0.363	0.696
Aspartic acid-3TMS ( $\times 10^{-2}$ )	Urinary	1.024	1.876	6.32 (4.82–9.39)	5.98 (2.58–10.06)	3.05 (1.59–5.05)	0.793	<b>0.045</b>
Azelaic acid-2TMS ( $\times 10^{-2}$ )	Urinary	1.078	0.823	0 (0–0.36)	1.14 (0–4.30)	1.52 (0–2.72)	0.067	0.106
Benzoic acid-TMS ( $\times 10^{-1}$ )	Urinary	0.259	0.492	4.45 (3.68–4.80)	4.17 (3.19–4.89)	4.88 (3.62–5.27)	0.918	0.38
Caproic acid-TMS ( $\times 10^{-1}$ )	Urinary	0.306	0.393	1.13 (0.93–1.33)	1.17 (0.93–1.30)	1.07 (0.99–1.21)	0.99	0.984
Catechol-2TMS ( $\times 10^{-2}$ )	Urinary	0.473	0.72	3.18 (2.16–8.76)	2.95 (1.53–6.34)	2.03 (0.91–5.17)	0.86	0.539
Cholesterol-TMS	Urinary	0.69	0	0 (0–0)	0 (0–0)	0 (0–0)	0.999	0.719
Citramalic acid-3TMS ( $\times 10^{-1}$ )	Urinary	1.338	0.617	3.88 (2.20–9.98)	3.95 (2.37–4.73)	3.92 (3.26–6.29)	0.682	0.999
Citric acid-4TMS	Urinary	0.652	0.929	14.94 (7.67–23.22)	15.10 (10.59–21.93)	12.17 (8.30–13.93)	0.979	0.637
Creatinine-3TMS	Urinary	1.649	1.797	1.02 (0.53–2.00)	0.64 (0.40–1.11)	0.57 (0.37–0.80)	0.175	0.125
Cystathionine-4TMS ( $\times 10^{-2}$ )	Urinary	1.224	0.404	0 (0–0.94)	1.07 (0–2.15)	0 (0–1.55)	0.154	0.957
Cysteine-3TMS ( $\times 10^{-1}$ )	Urinary	0.7	0.827	2.75 (1.64–4.74)	2.42 (1.56–3.93)	1.67 (0.83–2.56)	0.793	0.195
Cystine-4TMS ( $\times 10^{-2}$ )	Urinary	0.498	0.694	3.64 (3.04–4.43)	4.62 (1.39–8.38)	1.96 (0–4.66)	0.86	0.097
Cytosine-2TMS ( $\times 10^{-1}$ )	Urinary	0.688	1.323	1.79 (0.66–2.67)	1.61 (1.07–2.26)	1.24 (0.92–1.61)	0.979	0.447
Decanoic acid-TMS ( $\times 10^{-2}$ )	Urinary	0.646	0.893	5.98 (4.55–7.39)	5.47 (4.59–6.66)	5.17 (4.63–6.41)	0.827	0.637
Dihydroxyacetone phosphate-meto-3TMS ( $\times 10^{-1}$ )	Urinary	0.678	0.632	1.52 (0.63–1.94)	1.14 (0.51–1.88)	0.97 (0.60–1.46)	0.89	0.38
Docosahexaenoic acid-TMS ( $\times 10^{-2}$ )	Urinary	0.737	0.303	0 (0–1.40)	0 (0–1.24)	0 (0–1.10)	0.994	0.934
Elaidic acid-TMS ( $\times 10^{-1}$ )	Urinary	0.781	0.353	0.94 (0.87–1.20)	0.83 (0.54–1.76)	0.90 (0.60–1.49)	0.644	0.716

Ethylmalonic acid-2TMS ( $\times 10^{-1}$ )	Urinary	0.551	0.661	0.96 (0.46–1.11)	0.82 (0.52–1.19)	0.81 (0.51–1.29)	0.962	0.994
Fructose-meto-5TMS ( $\times 10^{-2}$ )	Urinary	0.673	1.531	7.50 (1.47–15.30)	4.01 (2.05–8.43)	3.54 (1.69–6.46)	0.644	0.348
Fucose-meto-4TMS ( $\times 10^{-2}$ )	Urinary	1.074	0.613	0 (0–1.89)	1.44 (0–1.68)	0 (0–1.09)	0.5	0.882
Fumaric acid-2TMS ( $\times 10^{-2}$ )	Urinary	1.443	0.966	5.23 (3.05–5.98)	6.81 (4.52–8.85)	6.48 (4.07–7.44)	0.235	0.319
Galactitol-6TMS ( $\times 10^{-1}$ )	Urinary	1.487	1.37	1.64 (1.15–4.71)	1.43 (0.75–2.51)	1.13 (0.77–2.05)	0.532	0.319
Galacturonic acid-meto-5TMS	Urinary	0.493	0.625	1.56 (0.74–2.55)	1.24 (1.05–2.06)	1.07 (0.72–1.59)	0.979	0.447
Glucaric acid-6TMS	Urinary	0.845	0.582	1.45 (0.86–2.13)	1.16 (0.90–1.58)	1.04 (0.77–1.34)	0.827	0.413
Gluconic acid-6TMS	Urinary	1.3	1.557	5.08 (1.93–5.51)	2.82 (1.75–4.00)	2.68 (2.00–3.66)	0.337	0.195
Glucosamine-5TMS ( $\times 10^{-1}$ )	Urinary	0.564	0.878	5.78 (3.13–6.95)	3.59 (3.19–7.12)	2.67 (1.38–5.82)	0.99	0.125
Glucose 6-phosphate-meto-6TMS	Urinary	0	0.803	0 (0–0)	0 (0–0)	0 (0–0)	0.999	0.706
Glucose-meto-5TMS ( $\times 10^{-1}$ )	Urinary	0.681	0.491	5.20 (2.60–8.50)	4.83 (3.32–9.02)	3.83 (2.97–6.40)	0.942	0.895
Glucuronic acid-meto-5TMS	Urinary	0.696	0.6	3.83 (1.57–5.51)	3.35 (2.27–5.06)	3.12 (1.77–3.92)	0.99	0.793
Glutamic acid-3TMS ( $\times 10^{-1}$ )	Urinary	0.92	1.273	2.72 (1.44–3.29)	1.88 (1.61–2.70)	1.50 (1.17–2.55)	0.719	0.195
Glutamine-3TMS ( $\times 10^{-1}$ )	Urinary	0.765	0.948	3.65 (2.60–6.14)	2.52 (1.82–5.40)	1.46 (0.85–4.98)	0.756	0.176
Glyceric acid-3TMS ( $\times 10^{-1}$ )	Urinary	0.809	0.84	1.50 (0.82–1.89)	1.93 (1.11–2.17)	1.84 (0.93–3.00)	0.396	0.52
Glycerol 3-phosphate-4TMS ( $\times 10^{-1}$ )	Urinary	0.699	0.625	3.70 (1.68–4.43)	2.51 (1.28–4.74)	2.46 (1.48–3.44)	0.918	0.348
Glycine-3TMS	Urinary	1.047	1.229	17.50 (12.37–28.87)	11.84 (8.86–25.98)	8.68 (6.68–18.71)	0.337	0.217
Glycolic acid-2TMS	Urinary	0.979	0.444	1.48 (0.87–2.38)	1.17 (0.83–1.61)	1.43 (1.01–1.87)	0.428	0.994
Glycyl-Glycine-4TMS	Urinary	1.301	1.111	0 (0–0)	0 (0–0)	0 (0–0)	0.309	0.331
Guanine-3TMS ( $\times 10^{-2}$ )	Urinary	0.791	1.745	7.87 (4.98–11.56)	6.67 (3.47–11.63)	4.37 (1.68–7.72)	0.644	0.087
Hippuric acid-TMS	Urinary	1.333	0.07	2.62 (0.77–5.62)	1.53 (0.73–3.83)	1.19 (0.35–3.44)	0.756	0.755
Histidine-3TMS	Urinary	1.038	1.01	5.36 (3.09–10.60)	2.36 (1.49–6.11)	1.39 (0.54–5.01)	0.258	0.157
Homocysteine-3TMS ( $\times 10^{-2}$ )	Urinary	1.313	0.584	2.19 (0–3.95)	1.17 (0–1.90)	0.27 (0–1.03)	0.519	0.263
Homogentisic acid-3TMS ( $\times 10^{-3}$ )	Urinary	1.254	1.05	0 (0–0)	0 (0–2.12)	0 (0–0)	0.216	0.304
Homovanillic acid-2TMS ( $\times 10^{-2}$ )	Urinary	0.72	0.253	3.02 (0.74–5.28)	2.40 (1.10–4.22)	1.62 (0.80–4.26)	0.99	0.677
Hydroquinone-2TMS ( $\times 10^{-2}$ )	Urinary	0.432	0.206	0 (0–1.63)	0 (0–1.19)	0 (0–1.42)	0.997	0.991
Hydroxylamine-3TMS	Urinary	1.83	1.883	0.67 (0.50–0.79)	0.89 (0.63–1.07)	0.92 (0.75–1.04)	0.101	<b>0.006</b>
Hypotaurine-3TMS ( $\times 10^{-2}$ )	Urinary	1.652	1.534	0 (0–0.68)	0 (0–6.53)	2.31 (0–6.42)	0.17	0.069
Hypoxanthine-2TMS ( $\times 10^{-1}$ )	Urinary	0.618	0.93	2.92 (1.82–3.97)	1.32 (2.17–4.23)	1.68 (0.83–3.16)	0.979	0.24

Indol-3-acetic acid-TMS ( $\times 10^{-2}$ )	Urinary	0.822	0.837	1.50 (0.59–4.03)	1.75 (0–2.89)	2.75 (0–4.98)	0.999	0.751
Inositol-6TMS ( $\times 10^{-1}$ )	Urinary	1.217	0.852	2.30 (1.77–3.00)	3.21 (1.97–4.28)	2.41 (1.55–3.87)	0.396	0.999
Isobutyrylglycine-TMS	Urinary	0.618	0.354	0 (0–0)	0 (0–0)	0 (0–0)	0.992	0.928
Isocitric acid-4TMS	Urinary	0.558	0.556	4.63 (2.14–5.84)	3.16 (2.43–5.84)	2.81 (1.94–5.18)	0.979	0.864
Isoleucine-2TMS ( $\times 10^{-1}$ )	Urinary	0.78	0.977	3.47 (2.91–4.82)	3.66 (1.69–4.78)	1.83 (1.16–4.03)	0.942	0.24
Isovalerylglycine-TMS ( $\times 10^{-3}$ )	Urinary	1.017	0.546	0 (0–2.37)	0 (0–0)	0 (0–0)	0.434	0.476
Kynurenic acid-2TMS ( $\times 10^{-1}$ )	Urinary	1.396	1.255	1.73 (0.65–3.32)	1.33 (0.71–1.95)	1.03 (0.71–1.61)	0.569	0.483
Kynurenine-2TMS ( $\times 10^{-1}$ )	Urinary	0.723	0.805	0.98 (0.36–1.29)	0.71 (0.47–1.25)	0.39 (0.20–0.70)	0.999	0.176
Lactic acid-2TMS	Urinary	1.177	1.584	0.69 (0.55–0.91)	0.92 (0.63–1.11)	1.00 (0.69–1.20)	0.213	0.067
Lactose-meto-8TMS ( $\times 10^{-2}$ )	Urinary	1.283	1.223	2.44 (0.84–9.05)	1.85 (1.32–5.05)	1.34 (0.63–4.37)	0.827	0.429
Lauric acid-TMS ( $\times 10^{-1}$ )	Urinary	0.967	0.626	0.87 (0.68–0.99)	0.79 (0.69–1.24)	0.88 (0.68–0.99)	0.89	0.945
Leucine-2TMS	Urinary	0.756	0.885	1.21 (0.88–1.49)	0.98 (0.52–1.50)	0.66 (0.44–1.46)	0.89	0.447
Linoleic acid-TMS ( $\times 10^{-2}$ )	Urinary	0.592	0.438	1.57 (1.48–2.28)	1.68 (1.25–2.10)	1.55 (1.21–2.04)	0.606	0.558
Lysine-4TMS ( $\times 10^{-1}$ )	Urinary	0.551	0.568	4.93 (1.98–6.30)	4.63 (2.66–8.84)	1.80 (1.16–4.84)	0.942	0.319
Lyxose-meto-4TMS ( $\times 10^{-1}$ )	Urinary	0.483	1.062	4.03 (2.30–6.39)	4.33 (2.50–5.43)	2.94 (2.45–3.58)	0.99	0.264
Maleic acid-2TMS ( $\times 10^{-2}$ )	Urinary	0.964	1.25	4.10 (1.91–5.35)	3.21 (1.76–5.39)	2.58 (1.56–4.55)	0.999	0.716
Malic acid-3TMS ( $\times 10^{-2}$ )	Urinary	0.911	0.891	0 (0–1.25)	0.67 (0–1.21)	0.43 (0–1.01)	0.715	0.866
Malonic acid-2TMS ( $\times 10^{-2}$ )	Urinary	1.701	0.477	1.27 (1.01–2.03)	2.19 (1.68–2.94)	1.30 (0.85–1.59)	0.062	0.984
Mannitol-6TMS	Urinary	0.927	0.724	1.25 (1.09–2.68)	1.93 (0.87–3.10)	1.30 (0.70–2.84)	0.998	0.716
Mannose-meto-5TMS ( $\times 10^{-1}$ )	Urinary	0.72	0.566	0.43 (0.20–0.69)	0.68 (0.48–1.22)	0.59 (0.28–0.88)	0.175	0.637
Margaric acid-TMS ( $\times 10^{-2}$ )	Urinary	0.705	0.419	2.69 (2.43–3.56)	2.67 (2.07–3.29)	2.64 (2.17–3.43)	0.827	0.755
Mesaconic acid-2TMS ( $\times 10^{-1}$ )	Urinary	1.425	0.763	0.85 (0.48–1.15)	1.29 (0.55–1.93)	0.78 (0.60–1.84)	0.366	0.923
meso-Erythritol-4TMS ( $\times 10^{-1}$ )	Urinary	0.955	0.576	2.95 (1.83–4.22)	3.81 (2.04–4.37)	2.05 (1.50–3.12)	0.827	0.558
Methionine sulfone-2TMS ( $\times 10^{-2}$ )	Urinary	0.863	1.097	1.51 (0.96–2.67)	1.53 (0.62–2.54)	0.80 (0–2.18)	0.99	0.197
Methionine-2TMS ( $\times 10^{-2}$ )	Urinary	0.876	1.042	0 (0–1.63)	0 (0–1.13)	0 (0–0.76)	0.792	0.528
Methylmalonic acid-2TMS ( $\times 10^{-2}$ )	Urinary	0.551	0.987	3.38 (2.59–5.55)	4.03 (2.83–5.84)	3.49 (2.67–4.19)	0.89	0.864
Methylsuccinic acid-2TMS ( $\times 10^{-2}$ )	Urinary	0.272	0.835	3.09 (2.12–4.06)	3.39 (2.46–5.23)	5.46 (2.27–7.31)	0.89	0.413
Myristic acid-TMS ( $\times 10^{-1}$ )	Urinary	0.569	0.284	1.23 (1.08–1.82)	1.18 (0.89–1.63)	1.26 (1.07–1.65)	0.606	0.999
N6-Acetyllysine-2TMS ( $\times 10^{-1}$ )	Urinary	0.567	0.832	2.45 (1.86–2.87)	2.05 (1.12–3.37)	1.13 (0.42–3.52)	0.99	0.319

N-Acetylaspartic acid-3TMS ( $\times 10^{-1}$ )	Urinary	1.21	1.46	1.88 (0.78–3.03)	1.18 (0.67–1.93)	0.70 (0.32–1.12)	0.497	0.077
N-Acetylglutamine-2TMS ( $\times 10^{-2}$ )	Urinary	0.846	1.224	2.59 (0.75–3.71)	1.43 (0–2.96)	1.39 (0.85–2.80)	0.39	0.518
N-Acetylmannosamine-meto-4TMS ( $\times 10^{-2}$ )	Urinary	0.808	0.661	4.26 (2.24–6.18)	3.53 (2.50–4.32)	3.14 (1.59–4.90)	0.682	0.716
N-Acetylneuraminic acid-6TMS ( $\times 10^{-1}$ )	Urinary	0.794	0.63	1.62 (0.77–2.51)	1.25 (0.90–1.81)	0.98 (0.57–1.65)	0.979	0.413
N-Acetylserine-2TMS ( $\times 10^{-2}$ )	Urinary	0.49	0.631	1.15 (0–1.24)	0.42 (0–1.09)	0.83 (0–1.16)	0.594	0.624
N-Acetyltyrosine-2TMS	Urinary	1.052	0.598	0 (0–0)	0 (0–0)	0 (0–0)	0.483	0.706
Niacinamide-TMS ( $\times 10^{-1}$ )	Urinary	0.87	0.637	0.65 (0.43–1.31)	0.89 (0.49–1.50)	0.75 (0.35–1.01)	0.606	0.999
Nicotinic acid-TMS ( $\times 10^{-2}$ )	Urinary	2.023	2.303	0.99 (0.35–1.37)	3.58 (1.57–7.82)	6.45 (2.19–10.18)	<b>0.031</b>	<b>0.001</b>
Nonanoic acid-TMS ( $\times 10^{-1}$ )	Urinary	1.257	1.255	3.10 (2.53–3.65)	3.53 (2.88–4.15)	3.50 (2.97–3.98)	0.337	0.176
Norepinephrine-5TMS ( $\times 10^{-1}$ )	Urinary	0.804	0.396	1.18 (0.58–2.20)	1.15 (0.82–1.41)	1.58 (0.68–2.18)	0.999	0.716
Norvaline-2TMS ( $\times 10^{-2}$ )	Urinary	0.368	0.796	0 (0–1.01)	0 (0–1.55)	0 (0–0.80)	0.987	0.852
Octadecanol-TMS ( $\times 10^{-1}$ )	Urinary	0.41	1.224	2.24 (2.02–2.98)	2.33 (1.88–3.00)	2.04 (1.91–2.38)	0.998	0.217
Octanoic acid-TMS ( $\times 10^{-2}$ )	Urinary	0.772	0.603	5.34 (4.88–7.17)	6.63 (5.14–7.65)	5.85 (5.03–7.18)	0.719	0.716
Oleamide-TMS ( $\times 10^{-1}$ )	Urinary	0.904	0.43	2.54 (1.99–4.26)	3.01 (1.83–4.38)	2.40 (1.40–3.21)	0.998	0.52
Oleic acid-TMS ( $\times 10^{-1}$ )	Urinary	0.94	0.4	1.22 (1.09–1.35)	0.98 (0.59–1.51)	0.95 (0.77–1.76)	0.157	0.52
O-Phosphoethanolamine-4TMS	Urinary	0.723	0.849	0 (0–0)	0 (0–0)	0 (0–0)	0.808	0.768
Ornithine-4TMS ( $\times 10^{-1}$ )	Urinary	1.355	0.761	4.07 (2.01–4.89)	4.34 (2.56–6.78)	2.39 (1.44–5.05)	0.428	0.677
Oxalic acid-2TMS ( $\times 10^{-1}$ )	Urinary	0.935	0.951	3.75 (2.65–4.06)	3.78 (3.06–4.63)	4.02 (3.04–4.19)	0.682	0.413
Palmitic acid-TMS	Urinary	0.442	1.021	3.32 (3.03–4.19)	3.37 (2.52–4.22)	3.04 (2.73–3.73)	0.827	0.264
Palmitoleic acid-TMS ( $\times 10^{-2}$ )	Urinary	1.027	0.671	1.57 (0.76–2.11)	0.80 (0.26–1.63)	1.24 (0.91–2.87)	0.394	0.999
Pantothenic acid-3TMS ( $\times 10^{-2}$ )	Urinary	0.487	0.889	1.51 (0.60–2.83)	0.79 (0–3.07)	1.09 (0–1.42)	0.66	0.497
ParaXanthine-TMS ( $\times 10^{-2}$ )	Urinary	2.003	1.43	1.53 (0.33–3.38)	4.67 (2.68–9.04)	4.53 (1.64–8.11)	<b>0.018</b>	0.155
Phenylalanine-2TMS	Urinary	0.909	1.219	1.79 (1.28–2.10)	1.44 (0.78–1.88)	0.82 (0.66–1.89)	0.428	0.24
Phenylpyruvic acid-meto-TMS	Urinary	0	0.803	0 (0–0)	0 (0–0)	0 (0–0)	0.999	0.706
Phosphoric acid-3TMS	Urinary	0.982	0.412	120.0 (94.3–175.1)	152.4 (104.1–184.4)	130.6 (99.8–158.7)	0.606	0.999
Pimelic acid-2TMS ( $\times 10^{-2}$ )	Urinary	0.908	0.864	0 (0–0)	0 (0–1.03)	0 (0–0.54)	0.511	0.418
Proline-2TMS ( $\times 10^{-2}$ )	Urinary	0.882	0.68	4.53 (1.85–6.15)	5.17 (2.68–6.44)	3.20 (1.72–6.76)	0.756	0.923
Protocatechuic acid-3TMS ( $\times 10^{-3}$ )	Urinary	1.11	1.529	0 (0–2.57)	0 (0–0)	0 (0–0)	0.325	0.106
Psicose-meto-5TMS ( $\times 10^{-1}$ )	Urinary	1.242	1.545	2.74 (0.49–1.07)	1.59 (12.6–5.47)	1.34 (0.73–2.94)	0.918	0.637



Putrescine-4TMS ( $\times 10^{-1}$ )	Urinary	1.108	0.524	1.25 (0.64–1.93)	1.36 (0.97–1.99)	1.42 (0.85–1.93)	0.682	0.984
Pyridoxal-meto-2TMS	Urinary	1.221	0.505	0 (0–0)	0 (0–0)	0 (0–0)	0.861	0.928
Pyrogallol-3TMS ( $\times 10^{-1}$ )	Urinary	1.285	1.33	0.78 (0.32–11.28)	0.98 (0.30–3.58)	0.52 (0.12–1.33)	0.999	0.412
Pyruvic acid-meto-TMS ( $\times 10^{-1}$ )	Urinary	0.861	0.605	2.90 (1.62–3.89)	3.22 (2.32)	3.01 (2.10–3.67)	0.942	0.984
Quinolinic acid-2TMS ( $\times 10^{-1}$ )	Urinary	1.222	0.962	4.18 (2.30–6.91)	3.64 (2.36–3.85)	2.91 (2.22–5.07)	0.644	0.677
Ribitol-5TMS ( $\times 10^{-1}$ )	Urinary	0.856	0.645	1.02 (0.66–1.56)	1.06 (0.53–1.42)	0.61 (0.41–0.99)	0.99	0.195
Ribonic acid-5TMS	Urinary	0.711	0.625	1.70 (1.07–2.38)	1.47 (1.24–2.10)	1.08 (0.72–1.56)	0.606	0.24
Ribonolactone-3TMS ( $\times 10^{-2}$ )	Urinary	1.036	0.724	6.60 (4.05–9.89)	5.81 (3.37–8.16)	5.14 (2.94–8.51)	0.756	0.83
Ribose 5-phosphate-meto-5TMS ( $\times 10^{-3}$ )	Urinary	0.94	0.575	0 (0–8.05)	0 (0–2.90)	0 (0–0)	0.55	0.26
Ribose-meto-4TMS ( $\times 10^{-1}$ )	Urinary	0.661	0.902	0.91 (0.55–1.51)	1.00 (0.67–1.25)	0.69 (0.54–0.95)	0.979	0.291
Ribulose-meto-4TMS ( $\times 10^{-1}$ )	Urinary	0.687	0.958	2.23 (0.97–3.25)	1.99 (1.19–3.25)	1.31 (0.93–2.03)	0.979	0.52
Saccharopine-4TMS	Urinary	0	0.803	0 (0–0)	0 (0–0)	0 (0–0)	0.999	0.706
Sebacic acid-2TMS	Urinary	1.047	0.862	0 (0–0)	0 (0–0)	0 (0–0)	0.719	0.463
Serine-3TMS	Urinary	0.871	1.205	1.73 (1.46–3.64)	1.78 (1.14–3.57)	1.24 (0.67–2.29)	0.827	0.264
Sorbitol-6TMS ( $\times 10^{-1}$ )	Urinary	1.121	0.609	4.53 (3.23–7.23)	4.53 (3.23–7.23)	3.27 (2.49–3.79)	0.962	<b>0.029</b>
Sorbose-meto-5TMS ( $\times 10^{-2}$ )	Urinary	0.347	1.493	3.87 (1.89–12.82)	3.82 (2.43–9.62)	2.78 (1.32–5.78)	0.962	0.319
Spermidine-5TMS ( $\times 10^{-3}$ )	Urinary	0.657	0.159	0 (0–8.54)	0 (0–0)	0 (0–0)	0.78	0.995
Spermine-6TMS ( $\times 10^{-1}$ )	Urinary	0.813	0.679	1.04 (0.64–1.35)	1.14 (0.48–1.36)	0.80 (0.38–1.64)	0.999	0.558
Stearic acid-TMS	Urinary	0.448	0.509	2.45 (2.40–3.20)	2.62 (2.26–3.17)	2.50 (2.17–3.36)	0.999	0.994
Suberic acid-2TMS ( $\times 10^{-2}$ )	Urinary	1.089	0.912	0 (0–0.46)	0.73 (0–3.06)	0.90 (0–1.88)	0.341	0.145
Succinic acid-2TMS ( $\times 10^{-1}$ )	Urinary	1.239	0.238	0.95 (0.75–1.28)	0.91 (0.73–1.09)	0.95 (0.65–1.17)	0.827	0.923
Sucrose-8TMS	Urinary	2.17	2.131	1.08 (0.04–1.20)	0.17 (0.14–0.37)	0.19 (0.09–0.27)	0.428	0.52
Tagatose-meto-5TMS ( $\times 10^{-1}$ )	Urinary	1.299	1.641	0.93 (0.10–1.37)	0.37 (0.16–1.37)	0.27 (0.18–0.67)	0.719	0.447
Tartaric acid-4TMS	Urinary	0.639	0.646	0.12 (0.02–1.01)	0.15 (0.06–1.31)	0.13 (0.08–0.54)	0.719	0.984
Taurine-13C2-3TMS ( $\times 10^{-1}$ )	Urinary	0.376	0.56	0.49 (0.23–0.88)	0.68 (0.25–1.19)	0.51 (0.31–1.12)	0.827	0.793
Thiodiglycolic acid-2TMS ( $\times 10^{-3}$ )	Urinary	1.475	0.784	0 (0–6.60)	0 (0–0)	0 (0–0)	0.21	0.148
Threitol-4TMS ( $\times 10^{-1}$ )	Urinary	0.948	1.058	1.25 (0.53–2.51)	1.71 (1.12–2.17)	1.07 (0.66–1.38)	0.644	0.598
Threonic acid-4TMS	Urinary	0.762	0.749	2.04 (1.01–2.54)	1.53 (1.03–2.21)	1.24 (0.79–2.26)	0.606	0.598
Threonine-3TMS ( $\times 10^{-1}$ )	Urinary	0.831	0.883	3.56 (2..69–5.23)	3.31 (2.21–0.601)	2.67 (1.40–4.45)	0.998	0.291

Tiglylglycine-TMS	Urinary	0.675	0.419	0 (0–0)	0 (0–0)	0 (0–0)	0.861	0.928
Trehalose-8TMS ( $\times 10^{-2}$ )	Urinary	1.281	0.999	1.48 (0–16.58)	2.33 (0–6.08)	2.07 (1.29–7.76)	0.978	0.947
Triethanolamine-3TMS ( $\times 10^{-2}$ )	Urinary	0.631	1.071	0 (0–1.51)	0 (0–2.90)	0 (0–0)	0.669	0.617
Tryptophan-3TMS ( $\times 10^{-1}$ )	Urinary	1.07	0.597	1.47 (1.14–1.73)	1.87 (0.93–2.30)	0.88 (0.54–2.57)	0.532	0.348
Tyramine-3TMS ( $\times 10^{-1}$ )	Urinary	1.111	1.738	3.74 (1.94–7.25)	2.96 (1.77–4.60)	1.85 (1.12–3.42)	0.682	0.099
Tyrosine-3TMS	Urinary	0.671	0.783	3.92 (2.29–5.77)	3.44 (1.77–5.18)	1.90 (1.27–5.66)	0.86	0.291
Uracil-2TMS ( $\times 10^{-2}$ )	Urinary	1.013	1.56	0.59 (0–1.71)	0.58 (0–1.02)	0 (0–0.67)	0.836	0.154
Urea-2TMS	Urinary	0.708	0.503	172.1 (150.3–237.0)	201.6 (169.0–250.2)	197.6 (144.0–263.1)	0.86	0.968
Ureidopropionic acid-2TMS ( $\times 10^{-3}$ )	Urinary	0.643	0.498	8.46 (0–9.92)	0 (0–4.31)	0 (0–10.97)	0.252	0.799
Uric acid-4TMS	Urinary	0.727	0.446	4.48 (3.00–7.53)	3.59 (3.12–4.86)	4.70 (3.00–10.66)	0.644	0.948
Urocanic acid-2TMS ( $\times 10^{-1}$ )	Urinary	0.428	1.302	2.08 (1.03–2.54)	1.52 (1.09–1.97)	1.12 (0.88–1.47)	0.644	0.141
Valine-2TMS	Urinary	0.72	1.151	1.64 (1.11–1.91)	1.52 (0.85–1.80)	0.97 (0.71–1.72)	0.89	0.291
Vanilmandelic acid-3TMS ( $\times 10^{-1}$ )	Urinary	0.836	0.599	5.52 (2.29–8.37)	1.98 (2.93–6.07)	4.47 (2.66–5.57)	0.756	0.716
Xanthine-3TMS ( $\times 10^{-1}$ )	Urinary	0.887	0.611	0.54 (0.37–1.33)	0.66 (0.37–1.24)	0.39 (0.29–0.80)	0.918	0.558
Xanthosine-5TMS ( $\times 10^{-2}$ )	Urinary	0.975	0.663	1.08 (0.27–1.43)	1.03 (0–1.69)	0.49 (0–1.14)	0.998	0.432
Xylitol-5TMS ( $\times 10^{-1}$ )	Urinary	1.039	0.663	1.37 (0.64–2.22)	1.12 (0.80–1.74)	0.90 (0.61–1.42)	0.998	0.483
Xylose-meto-4TMS ( $\times 10^{-1}$ )	Urinary	1.525	0.661	1.20 (0.36–1.65)	1.45 (0.89–2.74)	0.80 (0.49–1.58)	0.283	0.968
Xylulose-meto-4TMS ( $\times 10^{-1}$ )	Urinary	0.712	1.014	3.05 (1.05–3.57)	2.48 (1.64–3.28)	1.66 (1.24–2.37)	0.979	0.558

Abbreviations: IQR, Interquartile range; arb.unit, arbitrary unit; VIP, variable importance for projection; AHU, asymptomatic hyperuricemia; SUA, serum urate level; TMS, tetramethylsilane. VIP<sup>1</sup> value was obtained from PLS regression analysis distinguished gout with SUA <9.0 mg/dL from asymptomatic hyperuricemia. VIP<sup>2</sup> value was obtained from PLS regression analysis distinguished gout with SUA ≥9.0 mg/dL from asymptomatic hyperuricemia. Raw P<sup>3</sup> and P<sup>4</sup> values were calculated from Steel with control tests comparing asymptomatic hyperuricemia to gout with SUA <9.0 mg/dL, and asymptomatic hyperuricemia to gout with SUA ≥9.0 mg/dL, respectively (without the Benjamini-Hochberg adjustment).

**Table S3. Summary of pathway analysis using potential biomarkers distinguishing overall gout and asymptomatic hyperuricemia groups.**

Metabolism	Raw p	$-\log_{10}(p)$	Adjusted <i>p</i>	$-\log_{10}(\text{adjusted } p)$	Impact
Citrate cycle (TCA cycle)	$3.33 \times 10^{-5}$	4.477	0.003	2.553	0.200
Glycolysis / Gluconeogenesis	0.002	2.692	0.057	1.247	0.101
Alanine, aspartate and glutamate metabolism	0.003	2.597	0.057	1.247	0.135
Taurine and hypotaurine metabolism	0.003	2.569	0.057	1.247	0.286
Glyoxylate and dicarboxylate metabolism	0.004	2.428	0.063	1.203	0.024
Butanoate metabolism	0.010	2.013	0.136	0.867	0.032
Pyruvate metabolism	0.020	1.689	0.246	0.610	0.207
Glutathione metabolism	0.032	1.491	0.339	0.470	0.011
Glycine, serine and threonine metabolism	0.044	1.359	0.368	0.434	0.000
Cysteine and methionine metabolism	0.044	1.359	0.368	0.434	0.096
Biosynthesis of unsaturated fatty acids	0.051	1.290	0.391	0.408	0.000
Arginine and proline metabolism	0.057	1.247	0.391	0.408	0.024
D-Glutamine and D-glutamate metabolism	0.060	1.219	0.391	0.408	0.000
Thiamine metabolism	0.070	1.154	0.421	0.376	0.000
Aminoacyl-tRNA biosynthesis	0.086	1.068	0.479	0.320	0.000
Caffeine metabolism	0.099	1.005	0.519	0.285	0.692
Arginine biosynthesis	0.136	0.867	0.671	0.173	0.000
Nicotinate and nicotinamide metabolism	0.145	0.839	0.675	0.170	0.000
Starch and sucrose metabolism	0.171	0.766	0.756	0.122	0.050
Pantothenate and CoA biosynthesis	0.180	0.745	0.756	0.122	0.000

Pathway analysis of the potential biomarkers was applied within the MetaboAnalyst 5.0 (<https://www.metaboanalyst.ca>). Pathway analysis was performed using referred KEGG (<http://www.kegg.jp>) homo sapiens pathway library and using the Hypergeometric test. P-values were adjusted by the Benjamini-Hochberg method to control the false discovery rate (FDR).

**Table S4. Summary of pathway analysis using potential biomarkers distinguishing gout with SUA  $\geq 9.0$  mg/dL and asymptomatic hyperuricemia groups.**

Metabolism	Raw p	$-\log_{10}(p)$	Adjusted p	$-\log_{10}(\text{adjusted } p)$	Impact
Citrate cycle (TCA cycle)	$1.38 \times 10^{-6}$	5.861	$1.16 \times 10^{-4}$	3.937	0.512
Glyoxylate and dicarboxylate metabolism	0.000	3.816	0.006	2.223	0.182
Alanine, aspartate and glutamate metabolism	0.000	3.670	0.006	2.223	0.333
Pyruvate metabolism	0.001	2.832	0.031	1.509	0.455
Glycolysis or Gluconeogenesis	0.004	2.449	0.060	1.224	0.200
Arginine biosynthesis	0.009	2.069	0.118	0.929	0.115
Butanoate metabolism	0.010	2.008	0.118	0.929	0.143
Nicotinate and nicotinamide metabolism	0.020	1.699	0.210	0.678	0.122
Biosynthesis of unsaturated fatty acids	0.025	1.606	0.231	0.636	0.043
Glycine, serine and threonine metabolism	0.049	1.310	0.398	0.400	0.045
D-Glutamine and D-glutamate metabolism	0.052	1.283	0.398	0.400	0.222
Arginine and proline metabolism	0.063	1.203	0.439	0.358	0.091
Histidine metabolism	0.158	0.801	1.000	0.000	0.032
Pantothenate and CoA biosynthesis	0.167	0.777	1.000	0.000	0.030
beta-Alanine metabolism	0.211	0.675	1.000	0.000	0.047
Porphyrin and chlorophyll metabolism	0.249	0.604	1.000	0.000	0.038
Cysteine and methionine metabolism	0.319	0.496	1.000	0.000	0.071
Aminoacyl-tRNA biosynthesis	0.331	0.481	1.000	0.000	0.014
Arachidonic acid metabolism	0.356	0.449	1.000	0.000	0.275
Tyrosine metabolism	0.380	0.420	1.000	0.000	0.011

Pathway analysis of the potential biomarkers was applied within the MetaboAnalyst 5.0 (<https://www.metaboanalyst.ca>). Pathway analysis was performed using referred KEGG (<http://www.kegg.jp>) homo sapiens pathway library and using the Hypergeometric test. P-values were adjusted by the Benjamini-Hochberg method to control the false discovery rate (FDR).