Supporting Information

Comparative metabolomics elucidates postprandial metabolic modifications in plasma of obese individuals with metabolic syndrome

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Additional Materials and Method:

Dietary modifications: Participants' energy requirements were estimated using the Harris-Benedict equation and adjusted for physical activity level. Three-day diets were planned to provide energy from carbohydrate, protein and fat at roughly 55–60%, 12–15% and <30% of total energy, respectively. Three-days food records were used to verify compliance with dietary modifications, and were reviewed for accuracy by a registered dietitian. Participants received a copy of their food record following the first trial, along with the same foods and beverages, in order to replicate their dietary pattern leading into the second trial. Energy and nutrient intakes were analyzed using Nutrition Data System for Research (NDSR 2011).

Endothelial function assessment, and malondialdehyde (MDA) measurement. Brachial artery flow-mediated dilation (FMD) was assessed by high-frequency ultrasonographical imaging. Briefly, a blood pressure cuff was placed on the right forearm and the brachial artery was imaged longitudinally in the distal third of the upper arm using a 5- to 12-MHz multi-frequency linear array transducer connected to a high-resolution ultrasound (T3000; Terason, Burlington, MA). Continuous Doppler velocity was simultaneously assessed at an insonation angle of 60°. After recording end-diastolic preocclusion brachial artery images for 1 min, the forearm cuff was inflated for 5 min using a rapid cuff inflator (Hokanson E20) and then rapidly released. Recordings of vessel diameter and blood velocity were obtained 1 min prior to cuff deflation and for 3 min thereafter at 5 frames/s (Camtasia Studio, TechSmith). A 3-frame smoothing average was used to determine maximal postocclusion diameter. Offline analyses were performed using automated edge-detection software with end-diastolic gating (Medical Imaging Applications). All vascular measurements and analyses were performed by the same technician who was unaware of the treatments. Relative FMD (%) was calculated as: [maximal postocclusion

diameter (mm) – preocclusion diameter (mm)]/preocclusion diameter (mm) x 100.Malondialdehyde (MDA), a marker of lipid peroxidation, was measured by HPLC-FL on the a Shimadzu HPLC-FL system as described before[1].

Table S1. Comparison of isocaloric low-fat milk and rice milk nutritional composition

	Low-fat milk	Rice milk
Volume, mL	475	435
Energy, kcal	205	206
Fat, g	5	4
Carbohydrate, g	24	40
Protein, g	16	1
Saturated fat, g	3	0
Cholesterol, mg	24	0
Sugars, g	25	23
Fiber, g	0	1
Sodium, mg	215	171
Calcium, mg	610	518
Magnesium, mg	54	48
Vitamin D, mg	6	5
a-Tocopherol, mg	0	2

Table S2. HPLC-MS/MS detection method for targeted metabolites in this study, two SRM transitions for each compound were used for most metabolites to ensure confident detection.

Compound	Retention Time (min)	Polarity	Precursor (m/z)	Product (m/z)	Collision Energy (V)	RF Lens (V)
N-acetyl-mannosamine	1.08	Positive	222.64	191.07	28.30	55
N-acetyl-mannosamine	1.08	Positive	222.64	207.07	15.76	55
alpha-hydroxyisobutyric acid	1.13	Positive	105.12	51.10	27.19	82
alpha-hydroxyisobutyric acid	1.13	Positive	105.12	77.04	10.25	82
Quinate	1.15	Positive	193.15	119.10	16.42	61
Quinate	1.15	Positive	193.15	175.18	10.25	61
Citrate	1.16	Positive	193.15	81.22	22.89	64
Citrate	1.16	Positive	193.15	175.16	12.48	64
Galactarate	1.16	Positive	211.12	175.11	11.82	51
Galactarate	1.16	Positive	211.12	193.18	10.25	51
Lauroylcarnitine	1.17	Positive	344.24	84.99	22.74	94
Lauroylcarnitine	1.17	Positive	344.24	284.97	15.92	94
Glycolaldehyde dimer	1.21	Positive	121.12	77.11	20.87	49
Glycolaldehyde dimer	1.21	Positive	121.12	103.13	10.25	49
Glutaric acid	1.44	Negative	131.09	87.07	11.42	55
Glutaric acid	1.44	Negative	131.09	113.11	12.78	55
Homocystine	1.23	Positive	268.97	180.89	45.55	249
Homocystine	1.23	Positive	268.97	252.89	24.87	249
Thiamine monophosphate	1.23	Positive	345.12	84.90	18.70	88
Shikimate	1.25	Positive	175.12	119.13	16.22	56
Shikimate	1.25	Positive	175.12	147.05	13.99	56
Tetrahydrofolate	1.25	Positive	446.09	341.88	15.71	77
Tetrahydrofolate	1.25	Positive	446.09	430.12	11.06	77
D-glyceric acid	2.29	Negative	105.21	59.18	11.16	44
D-glyceric acid	2.29	Negative	105.21	75.11	10.96	44
Paraxanthine	1.35	Positive	181.21	108.93	10.25	84
Paraxanthine	1.35	Positive	181.21	124.06	20.87	84
Pyridine-2,3-dicarboxylate	1.38	Positive	167.97	23.33	12.78	56
Pyridine-2,3-dicarboxylate	1.38	Positive	167.97	150.11	10.25	56
Theophylline	1.38	Positive	181.06	124.07	19.15	58
Theophylline	1.38	Positive	181.06	163.07	10.25	58
4-Acetamidobutanoate	1.39	Positive	146.27	86.11	11.57	39
4-Acetamidobutanoate	1.39	Positive	146.27	128.05	10.25	39
5'-Methylthioadenosine	1.41	Positive	298.09	136.07	17.69	66
5'-Methylthioadenosine	1.41	Positive	298.09	163.00	10.25	66
Thymine	1.44	Positive	127.30	84.04	15.87	62

Thymine	1.44	Positive	127.30	110.14	15.92	62
4-Pyridoxate	1.45	Positive	184.09	148.06	21.07	66
4-Pyridoxate	1.45	Positive	184.09	166.04	12.53	66
Nicotinamide	1.45	Positive	123.12	78.11	23.20	68
Nicotinamide	1.45	Positive	123.12	80.11	20.16	68
Theobromine	1.45	Positive	181.15	138.04	17.13	85
Theobromine	1.45	Positive	181.15	163.07	16.02	85
2,4-Dihydroxypyrimidine-5-carboxylic acid	1.5	Positive	157.09	116.11	10.25	45
2,4-Dihydroxypyrimidine-5-carboxylic acid	1.5	Positive	157.09	139.01	12.48	45
pantothenic acid	1.52	Positive	220.15	90.11	10.25	53
pantothenic acid	1.52	Positive	220.15	201.97	12.98	53
Purine	1.54	Positive	121.12	67.11	28.46	102
Purine	1.54	Positive	121.12	94.00	20.67	102
N-acetylaspartic acid	1.61	Positive	176.12	88.11	14.10	47
N-acetylaspartic acid	1.61	Positive	176.12	158.13	10.25	47
Uridine	1.65	Positive	245.15	113.07	10.25	48
Uridine	1.65	Positive	245.15	117.03	10.25	48
glucosamine	1.69	Positive	180.15	139.22	11.87	43
glucosamine	1.69	Positive	180.15	163.06	10.25	43
Creatinine	1.97	Positive	114.12	44.22	17.28	38
Creatinine	1.97	Positive	114.12	86.11	11.26	38
5-Hydroxymethyluracil	1.71	Positive	143.15	97.18	10.25	44
5-Hydroxymethyluracil	1.71	Positive	143.15	125.11	10.25	44
Adenine	1.71	Negative	134.00	92.08	18.24	69
Adenine	1.71	Negative	134.00	107.04	19.71	69
kynurenine	2.23	Positive	209.15	178.98	21.68	102
kynurenine	2.23	Positive	209.15	192.95	19.35	102
Phenylalanine	1.86	Positive	166.15	103.07	27.65	54
Phenylalanine	1.86	Positive	166.15	120.11	13.79	54
Tryptophan	1.8	Positive	205.15	146.04	15.76	41
Tryptophan	1.8	Positive	205.15	188.07	10.81	41
leucine/isoleucine	1.81	Positive	132.15	69.18	16.67	40
leucine/isoleucine	1.81	Positive	132.15	86.18	10.25	40
6'-Hydroxynicotinate	1.82	Positive	140.12	94.04	21.98	86
6'-Hydroxynicotinate	1.82	Positive	140.12	122.07	17.64	86
glyceraldehyde 3-phosphate	1.83	Positive	171.15	69.15	15.41	46
glyceraldehyde 3-phosphate	1.83	Positive	171.15	153.17	10.25	46
N-acetylglutamic acid	1.83	Positive	190.18	84.11	22.79	47
N-acetylglutamic acid	1.83	Positive	190.18	130.13	12.33	47
Pyroglutamic acid	1.89	Positive	130.12	84.04	10.25	57
Pyroglutamic acid	1.89	Positive	130.12	102.04	10.25	57

cysteic acid	1.94	Positive	188.03	71.33	23.60	66
cysteic acid	1.94	Positive	188.03	169.93	10.25	66
Methionine	1.95	Positive	150.12	104.14	11.11	46
Methionine	1.95	Positive	150.12	133.00	10.25	46
N-acetyl-galactosamine	1.98	Positive	222.15	126.11	12.98	35
N-acetyl-galactosamine	1.98	Positive	222.15	204.11	10.25	35
N-methyl-aspartic acid	1.99	Positive	148.12	88.11	10.76	48
N-methyl-aspartic acid	1.99	Positive	148.12	102.11	11.06	48
5-Methylcytosine hydrochloride	2	Positive	126.15	107.99	18.95	88
5-Methylcytosine hydrochloride	2	Positive	126.15	109.00	20.11	88
Cytosine	2.02	Positive	112.30	69.11	16.78	72
Cytosine	2.02	Positive	112.30	95.05	21.48	72
Trigonelline	2.02	Positive	138.12	92.11	19.35	66
Trigonelline	2.02	Positive	138.12	120.03	10.25	66
Tyrosine	2.08	Positive	182.15	136.05	10.25	40
Tyrosine	2.08	Positive	182.15	165.00	11.42	40
Betaine	2.04	Positive	118.15	58.17	23.40	80
Betaine	2.04	Positive	118.15	59.17	19.00	80
Proline	2.05	Positive	116.15	70.11	12.83	56
Proline	2.05	Positive	116.15	88.11	13.24	56
Taurine	2.06	Positive	126.12	81.05	16.07	54
Taurine	2.06	Positive	126.12	108.04	10.25	54
N-acetylneuraminate	2.07	Positive	309.73	255.22	16.57	70
N-acetylneuraminate	2.07	Positive	309.73	291.96	10.25	70
N-Acetylserine	2.26	Positive	148.09	60.10	16.78	31
N-Acetylserine	2.26	Positive	148.09	106.11	10.25	31
Valine	2.1	Positive	118.15	72.11	13.69	56
Valine	2.1	Positive	118.15	100.11	13.39	56
Pipecolate	2.14	Positive	130.12	84.11	12.93	53
Pipecolate	2.14	Positive	130.12	102.11	10.40	53
Cysteinyl-Glycine	2.15	Positive	179.15	137.13	10.25	58
Cysteinyl-Glycine	2.15	Positive	179.15	161.11	10.25	58
aspartate	2.15	Positive	134.15	86.11	19.20	49
aspartate	2.15	Positive	134.15	116.05	10.25	49
pipecolate	2.14	Positive	130.12	84.11	12.93	53
pipecolate	2.14	Positive	130.12	102.11	10.40	53
Maleamate	2.15	Positive	116.12	72.17	12.83	53
Maleamate	2.15	Positive	116.12	88.11	13.29	53
5,6-Dihydrouracil	2.16	Positive	115.12	42.22	10.25	30
5,6-Dihydrouracil	2.16	Positive	115.12	74.11	10.25	30
Hypotaurine	2.18	Positive	110.09	82.13	12.43	58

Hypotaurine	2.18	Positive	110.09	92.06	10.25	58
Cysteine	2.17	Positive	122.12	59.04	22.14	34
Cysteine	2.17	Positive	122.12	76.06	13.08	34
Glycolate	1.84	Negative	75.12	31.29	10.25	35
Glycolate	1.84	Negative	75.12	47.18	10.25	35
4-Hydroxy-proline	2.23	Positive	132.27	68.05	21.12	34
4-Hydroxy-proline	2.23	Positive	132.27	86.13	11.67	34
Glycine	2.24	Positive	76.37	42.17	10.25	30
Glycine	2.24	Positive	76.37	58.10	10.25	30
Mesoxalate	2.24	Positive	119.12	91.11	15.71	53
Mesoxalate	2.24	Positive	119.12	101.18	10.25	53
2-Aminoisobutyric acid	2.25	Positive	104.12	45.15	10.25	30
2-Aminoisobutyric acid	2.25	Positive	104.12	58.17	11.42	30
3-Aminoisobutanoate	2.25	Positive	104.15	30.29	12.78	30
3-Aminoisobutanoate	2.25	Positive	104.15	86.11	10.25	30
N-acetylglycine	2.25	Positive	118.15	72.09	16.32	59
N-acetylglycine	2.25	Positive	118.15	100.04	13.14	59
3-Sulfinoalanine	2.27	Positive	154.12	106.14	14.55	63
3-Sulfinoalanine	2.27	Positive	154.12	122.01	10.25	63
5-Aminolevulinic acid	2.27	Positive	132.09	90.00	10.25	46
5-Aminolevulinic acid	2.27	Positive	132.09	114.05	11.26	46
Glyceraldehyde	2.27	Positive	91.15	63.04	27.70	131
Glyceraldehyde	2.27	Positive	91.15	65.11	20.47	131
1-Methylnicotinamide	2.28	Positive	138.15	93.10	21.17	78
1-Methylnicotinamide	2.28	Positive	138.15	95.06	19.56	78
4-Guanidinobutanoate	2.28	Positive	146.15	86.06	15.87	57
4-Guanidinobutanoate	2.28	Positive	146.15	87.04	13.44	57
Octopamine	2.28	Positive	154.15	113.07	10.25	45
Octopamine	2.28	Positive	154.15	136.04	10.25	45
N-acetylputrescine	1.89	Positive	130.12	84.04	10.25	57
N-acetylputrescine	1.89	Positive	130.12	102.04	10.25	57
N-formylglycine	2.29	Positive	104.15	45.15	17.08	50
N-formylglycine	2.29	Positive	104.15	63.10	10.25	50
4-Aminobutanoate	2.38	Positive	104.12	86.05	10.66	47
4-Aminobutanoate	2.38	Positive	104.12	87.13	10.35	47
3-phosphoglyceric acid	2.32	Positive	187.12	105.07	10.25	54
3-phosphoglyceric acid	2.32	Positive	187.12	155.13	10.25	54
Dopamine	2.33	Positive	154.15	91.18	21.78	46
Dopamine	2.33	Positive	154.15	137.13	12.68	46
alanine	2.34	Positive	90.15	44.22	11.01	42
alanine	2.34	Positive	90.15	45.22	10.25	42
Ethanolamine	2.35	Positive	62.15	44.18	12.38	51
Ethanolamine	2.35	Positive	62.15	46.11	34.17	51

acetyllysine	2.35	Positive	189.15	84.11	21.78	53
acetyllysine	2.35	Positive	189.15	129.11	14.05	53
Creatine	2.36	Positive	132.12	86.11	10.25	39
Creatine	2.36	Positive	132.12	114.11	10.25	39
5-Aminopentanoate	2.39	Positive	118.15	55.15	16.42	52
5-Aminopentanoate	2.39	Positive	118.15	101.11	10.25	52
Homoserine	2.39	Positive	120.12	56.11	17.03	41
Homoserine	2.39	Positive	120.12	74.11	10.25	41
carnitine	2.39	Positive	162.12	85.07	20.52	78
carnitine	2.39	Positive	162.12	103.00	17.03	78
Threonine	2.39	Positive	120.12	74.11	10.25	41
Threonine	2.39	Positive	120.12	102.05	10.25	41
SN-glycero-3-phosphocholine	2.43	Positive	259.18	105.11	15.16	79
SN-glycero-3-phosphocholine	2.43	Positive	259.18	124.97	26.89	79
4-Imidazoleacetic acid	2.46	Positive	127.15	81.04	16.52	47
4-Imidazoleacetic acid	2.46	Positive	127.15	109.04	10.25	47
Guanidinoacetate	2.49	Positive	118.15	72.18	15.87	56
Guanidinoacetate	2.49	Positive	118.15	100.18	13.54	56
Deoxycarnitine	2.51	Positive	146.15	60.17	13.84	57
Deoxycarnitine	2.51	Positive	146.15	87.04	15.71	57
Hydroxypyruvate	2.57	Positive	105.15	63.13	10.25	30
Hydroxypyruvate	2.57	Positive	105.15	64.07	10.25	30
Glutamine	2.45	Positive	147.15	84.11	18.24	62
Glutamine	2.45	Positive	147.15	129.98	11.82	62
Inosine 5'-triphosphate	2.66	Positive	508.94	262.95	24.61	89
Inosine 5'-triphosphate	2.66	Positive	508.94	344.94	10.25	89
Serine	2.74	Positive	106.15	60.11	10.25	42
Serine	2.74	Positive	106.15	88.00	10.25	42
Citrulline	2.7	Positive	176.15	70.11	22.29	30
Citrulline	2.7	Positive	176.15	159.04	11.92	30
Fucose(6-Deoxy-L-galactose)	2.72	Positive	165.12	105.04	10.25	56
Fucose(6-Deoxy-L-galactose)	2.72	Positive	165.12	123.11	10.25	56
Asparagine	2.67	Positive	133.12	74.04	15.61	36
Asparagine	2.67	Positive	133.12	87.11	10.25	36
Pyridoxamine	2.87	Positive	169.12	134.07	22.14	30
Pyridoxamine	2.87	Positive	169.12	152.05	11.67	30
Glutamic acid	2.95	Positive	148.15	84.20	15.01	45
Glutamic acid	2.95	Positive	148.15	130.25	10.91	45
3-methylhistidine	3.31	Positive	170.15	109.06	15.26	56
3-methylhistidine	3.31	Positive	170.15	124.04	15.01	56
Histidine	3.15	Positive	156.00	83.02	23.35	49

Histidine	3.15	Positive	156.00	110.13	12.12	49
phosphoserine(O-phospho-DL-serine)	4	Positive	186.15	88.13	10.25	54
phosphoserine(O-phospho-DL-serine)	4	Positive	186.15	145.13	10.25	54
Lysine	3.94	Positive	147.12	84.02	15.61	43
Lysine	3.94	Positive	147.12	130.18	13.08	43
Orinthine	4.36	Positive	133.15	105.10	15.51	47
Orinthine	4.36	Positive	133.15	115.10	11.67	47
Cystine	4.7	Positive	241.30	119.99	18.39	59
Cystine	4.7	Positive	241.30	151.93	12.68	59
2-aminoethyl phosphonate	4.71	Positive	126.09	81.00	21.88	59
2-aminoethyl phosphonate	4.71	Positive	126.09	109.02	12.93	59
Guanosine 5'-diphosphoglucose	5.1	Positive	444.06	152.10	19.96	91
5-phospho-ribose 1-diphosphate	12.23	Positive	391.18	149.10	19.96	0
5-phospho-ribose 1-diphosphate	12.23	Positive	391.18	167.14	13.24	0
Hypoxanthine	1.64	Negative	135.27	92.04	16.67	60
Hypoxanthine	1.64	Negative	135.27	133.05	20.42	60
Orotate	1.71	Negative	155.27	42.17	23.40	39
Orotate	1.71	Negative	155.27	111.05	10.25	39
lactate	1.75	Negative	89.09	43.22	10.25	42
lactate	1.75	Negative	89.09	61.08	10.25	42
Allantoin	1.79	Negative	157.03	97.10	17.03	51
Allantoin	1.79	Negative	157.03	114.05	14.85	51
Dihydroorotate	1.84	Negative	156.94	42.14	26.08	30
Dihydroorotate	1.84	Negative	156.94	113.04	10.25	30
Ascorbate	1.9	Negative	175.27	87.11	18.90	50
Ascorbate	1.9	Negative	175.27	115.07	10.25	50
urate	2.04	Negative	167.21	124.08	14.90	60
urate	2.04	Negative	167.21	147.08	10.25	60
sarcosine	2.23	Negative	88.09	42.17	12.68	42
sarcosine	2.23	Negative	88.09	45.21	10.25	42
glycerate	2.29	Negative	105.21	59.18	11.16	44
glycerate	2.29	Negative	105.21	75.11	10.96	44

Table S3. List of 8 metabolites that shown significant treatment, time, and interaction effects.

Metabolite	**Rice or Low Fat**	**Time**	**Interaction**
Orotate	9.82E-11	1.15E-10	7.91E-11
leucine/isoleucine	6.60E-05	1.15E-10	5.25E-05
Asparagine	1.43E-02	6.63E-12	2.41E-04
Mesoxalate	2.28E-02	2.66E-14	1.01E-02
Methionine	2.89E-02	9.94E-09	2.84E-05
Adenine	3.31E-02	4.78E-05	9.43E-03
Homoserine	3.59E-02	1.66E-11	5.59E-03
Threonine	4.86E-02	2.39E-10	5.51E-03

Table S4. List of 10 metabolites having significant *p*-value in ANOVA-simultaneous component analysis (ASCA) time-treatment interaction analysis.

Metabolite	**Leverage**	**SPE**
4-Aminobutanoate	0.098	0.357
Orotate	0.094	1.407
leucine/isoleucine	0.073	1.316
Taurine	0.055	1.063
3-Aminoisobutanoate	0.054	0.802
Adenine	0.053	0.837
4-Imidazoleacetic acid	0.048	1.849
Methionine	0.046	2.851
5-Methylcytosine hydrochloride	0.046	0.833
4-Pyridoxate	0.043	0.551

Table S5. Pathway analysis results in comparison of low-fat milk and rice milk groups at 120 mins.

Pathways	Total Cmpd	Hits	Raw p	-LOG(p)	Holm adjust	FDR	Impact
Alanine, aspartate and glutamate metabolism	24	7	4.45E-02	3.11	1.00	0.14	0.85
Glycine, serine and threonine metabolism	48	16	2.65E-03	5.93	0.14	0.03	0.61
Arginine and proline metabolism	77	16	9.88E-03	4.62	0.46	0.06	0.53
Taurine and hypotaurine metabolism	20	6	3.38E-01	1.08	1.00	0.52	0.53
Caffeine metabolism	21	4	3.43E-01	1.07	1.00	0.52	0.45
Cysteine and methionine metabolism	56	12	1.21E-02	4.41	0.56	0.06	0.31
Lysine degradation	47	7	3.02E-01	1.20	1.00	0.52	0.30
Aminoacyl-tRNA biosynthesis	75	20	3.63E-03	5.62	0.19	0.03	0.24
Pantothenate and CoA biosynthesis	27	5	1.52E-01	1.88	1.00	0.33	0.20
Histidine metabolism	44	5	3.13E-01	1.16	1.00	0.52	0.19
Thiamine metabolism	24	4	3.92E-02	3.24	1.00	0.13	0.17
Nicotinate and nicotinamide metabolism	44	6	5.88E-01	0.53	1.00	0.67	0.16
Pyrimidine metabolism	60	7	3.70E-06	12.51	0.00	0.00	0.13
Phenylalanine, tyrosine and tryptophan biosynthesis	27	5	3.27E-02	3.42	1.00	0.12	0.11
Lysine biosynthesis	32	3	1.53E-02	4.18	0.69	0.07	0.10
Glyoxylate and dicarboxylate metabolism	50	4	4.25E-01	0.85	1.00	0.55	0.08
Sulfur metabolism	18	3	2.63E-03	5.94	0.14	0.03	0.07
Vitamin B6 metabolism	32	3	2.23E-01	1.50	1.00	0.43	0.06
Purine metabolism	92	6	5.62E-02	2.88	1.00	0.16	0.03
beta-Alanine metabolism	28	5	7.01E-01	0.36	1.00	0.73	0.02
Glutathione metabolism	38	6	2.44E-01	1.41	1.00	0.45	0.02
Methane metabolism	34	3	1.31E-01	2.03	1.00	0.31	0.02
Nitrogen metabolism	39	10	5.36E-03	5.23	0.26	0.04	0.01
Porphyrin and chlorophyll metabolism	104	4	7.19E-02	2.63	1.00	0.19	0.01
Cyanoamino acid metabolism	16	4	6.77E-03	5.00	0.32	0.04	0.00

Figure Legends:

Figure S1. Metabolic profiles of targeted metabolites of 19 participants at 0 minutes (before beverage administration). L: low-fat milk trial; R: rice milk trial.

Figure S2. Metabolic profiles of targeted metabolites of 19 MetS participants at 30 minutes post beverage administration. L: low-fat milk trial; R: rice milk trial.

Figure S3. Metabolic profiles of targeted metabolites of 19 MetS participants at 60 minutes post beverage administration. L: low-fat milk trial; R: rice milk trial.

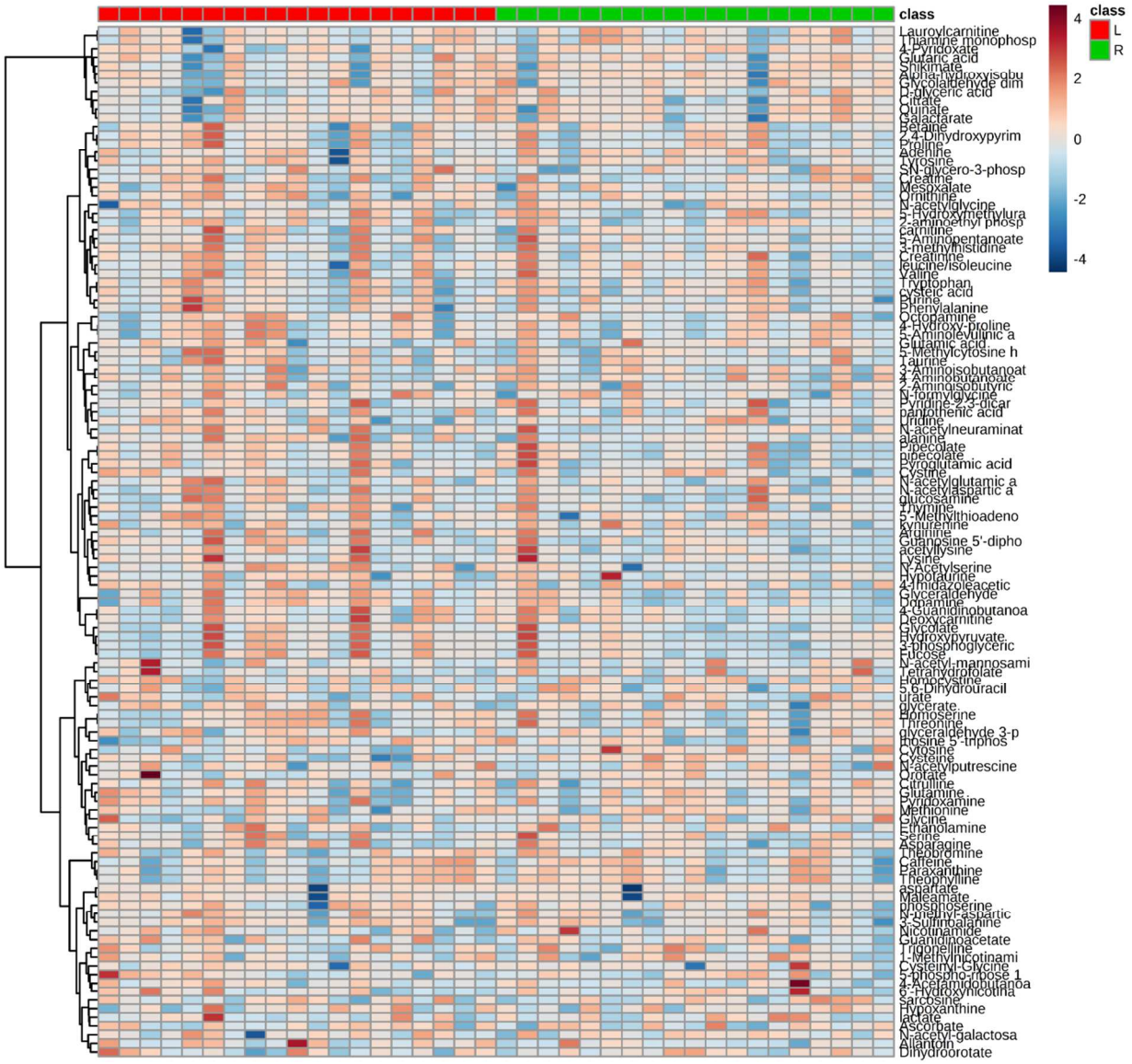
Figure S4. Metabolic profiles of targeted metabolites of 19 MetS participants at 90 minutes post beverage administration. L: low-fat milk trial; R: rice milk trial.

Figure S5. Metabolic profiles of targeted metabolites of 19 MetS participants at 120 minutes post beverage administration. L: low-fat milk trial; R: rice milk trial.

Figure S6. Metabolic profiles of targeted metabolites of 19 MetS participants at 150 minutes post beverage administration. L: low-fat milk trial; R: rice milk trial.

Figure S7. Metabolic profiles of targeted metabolites of 19 MetS participants at 180 minutes post beverage administration. L: low-fat milk trial; R: rice milk trial.

Figure S8. Time course measurement of clinical characteristics that showing different time trends in low-fat (L) and rice milk (R) groups. (A) Plasma Insulin (pmol/l), (B) Plasma Glucose (mmol/l), (C) Plasma Arginine (µmol/L), (D) Plasma MDA (µmol/L) and (E) Brachial artery FMD (%).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Galactarate
Betaine
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2-aminoethyl phosp
Carnitine
5-Aminopentanoate
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Leucine/isoleucine
Valine
Tryptophan
cysteic acid
Purine
Phenylalanine
Octopamine
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5-Aminolevulinic a
Glutamic acid
5-Methylcytosine h
Taurine
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2-Aminoisobutyric
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Pyridine-2,3-dicar
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Uridine
N-acetylneuraminat
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Pipecolate
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Pyroglutamic acid
Cystine
N-acetylglutamic a
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Arginine
Guanosine 5'-dipho
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Lysine
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Hypotaurine
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Glyceraldehyde
Dopamine
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Deoxycarnitine
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Cysteine
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Orotate
Citrulline
Glutamine
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Methionine
Glycine
Ethanolamine
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Asparagine
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Caffeine
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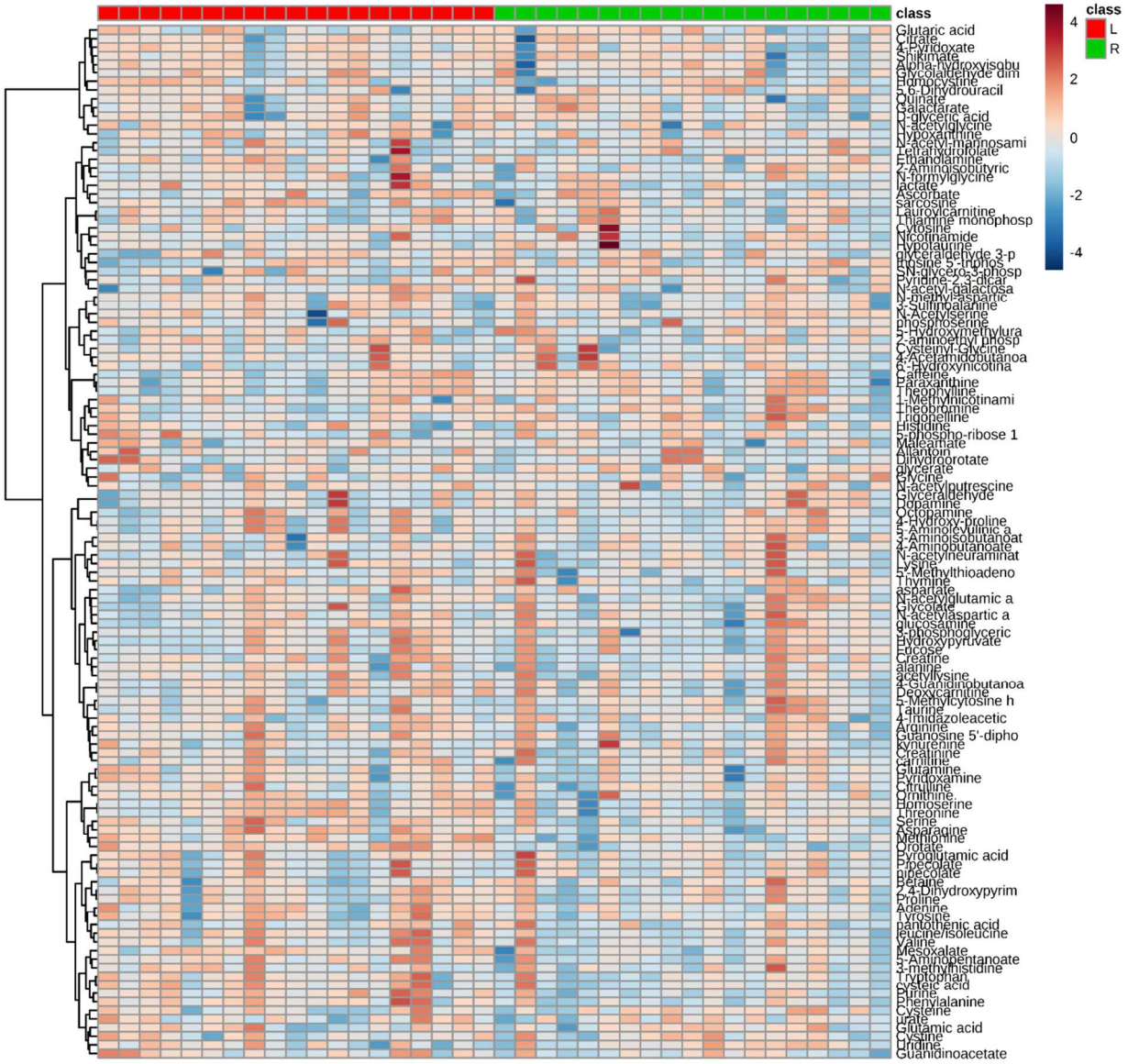
Allantoin
Dihydroorotate

Figure S1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Cytosine
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phosphoserine
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Taurine
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Creatinine
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Homoserine
Threonine
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Orotate
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Betaine
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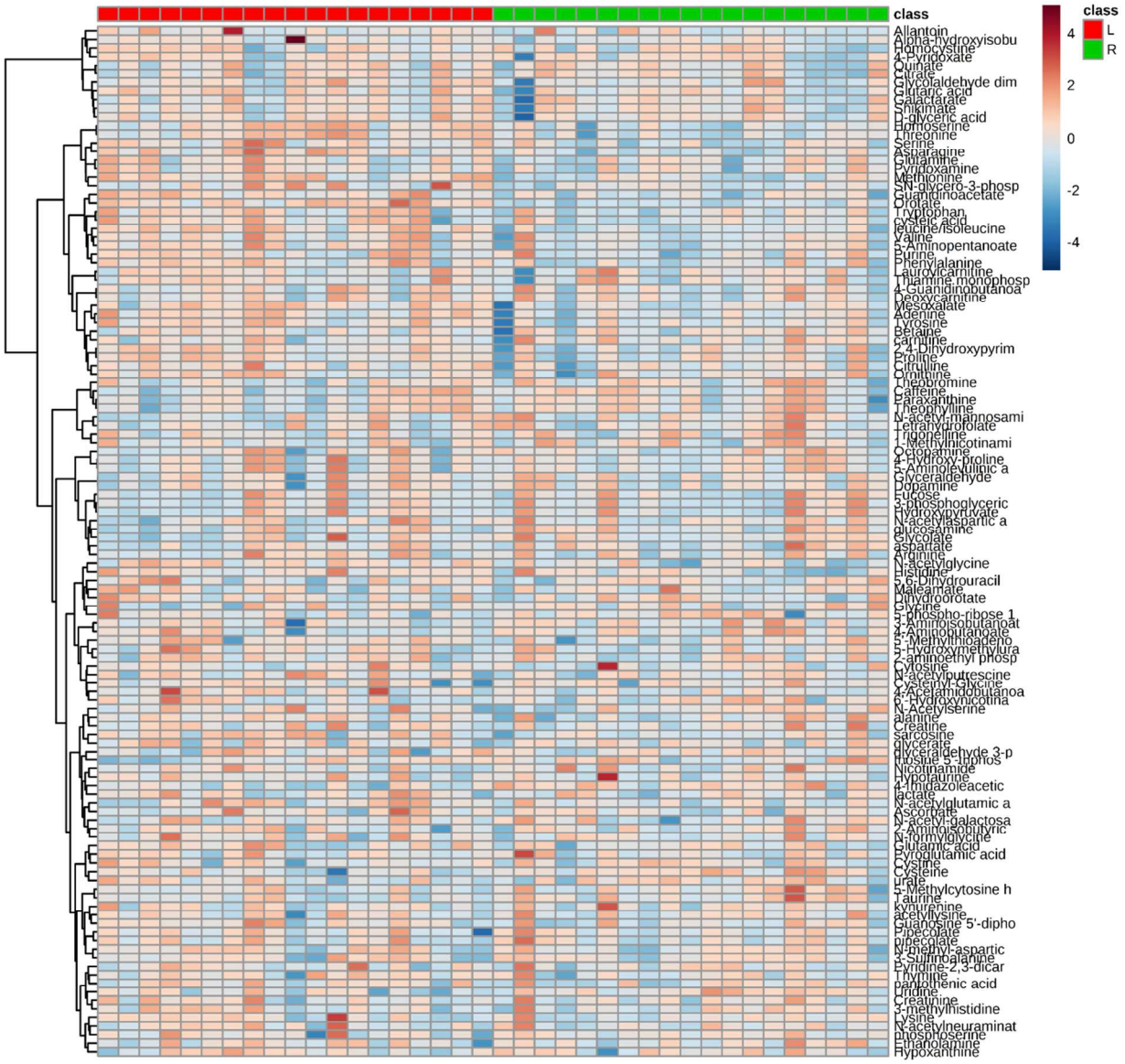
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Pyroglutamic acid
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Cysteine
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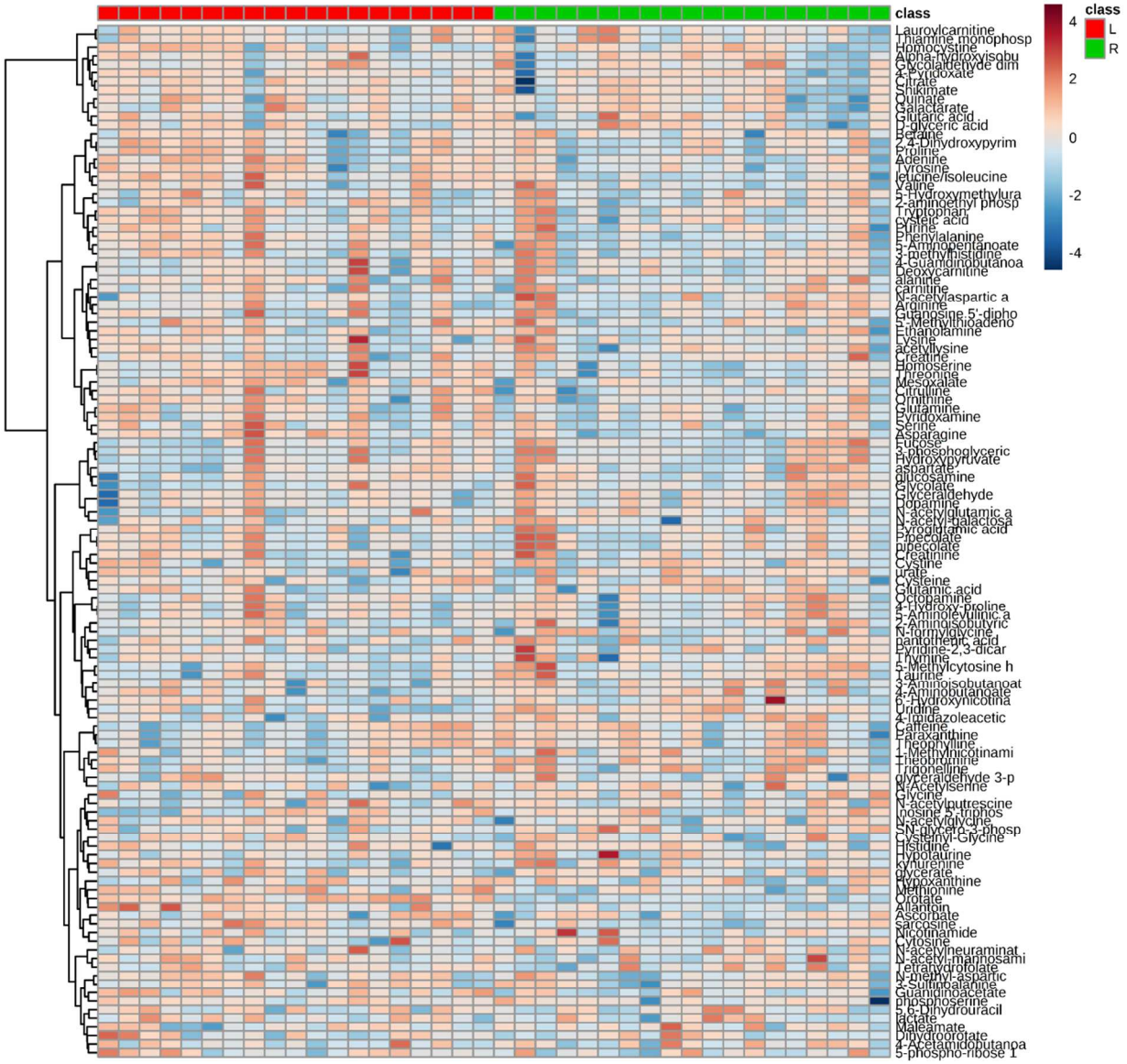
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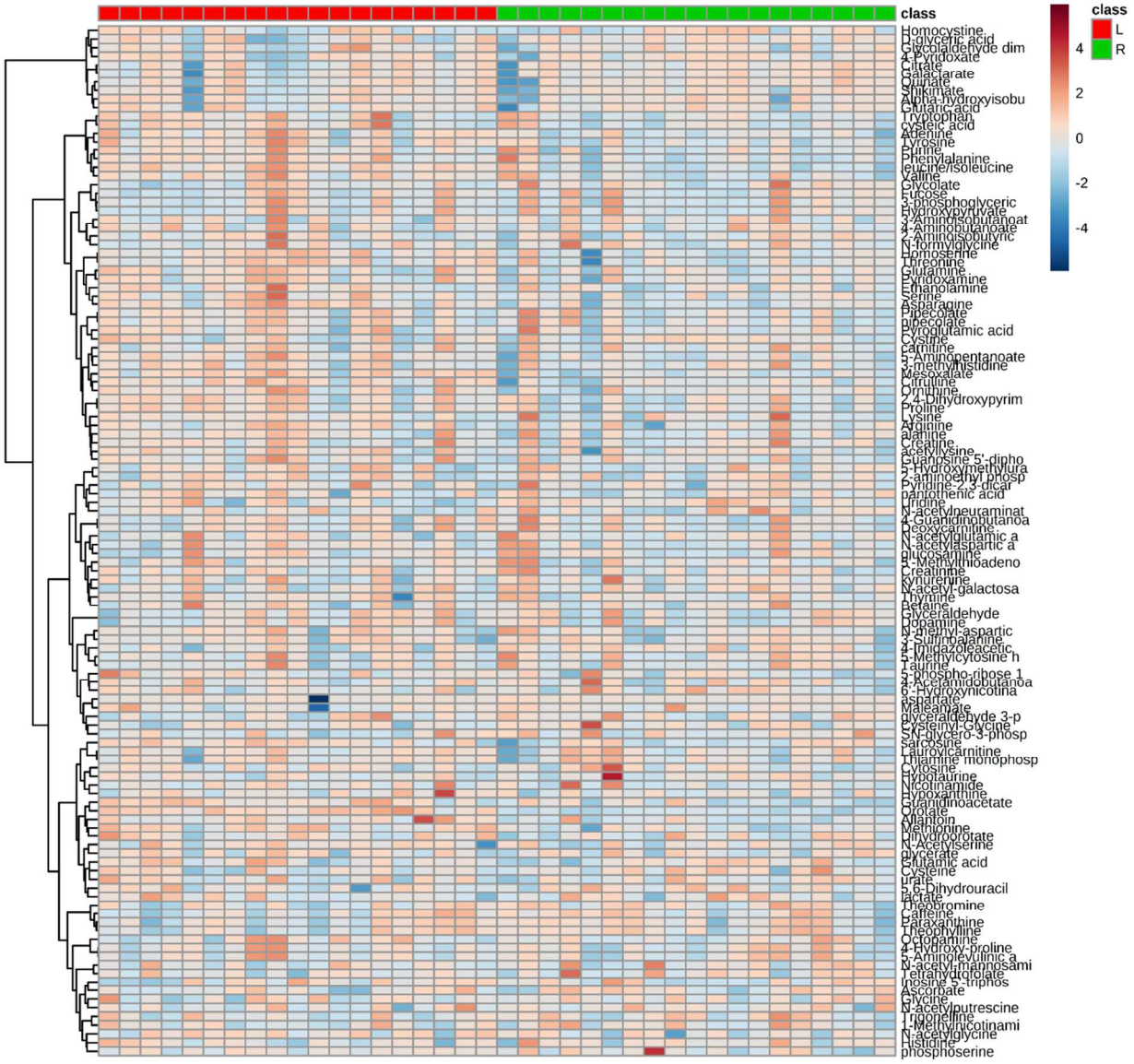
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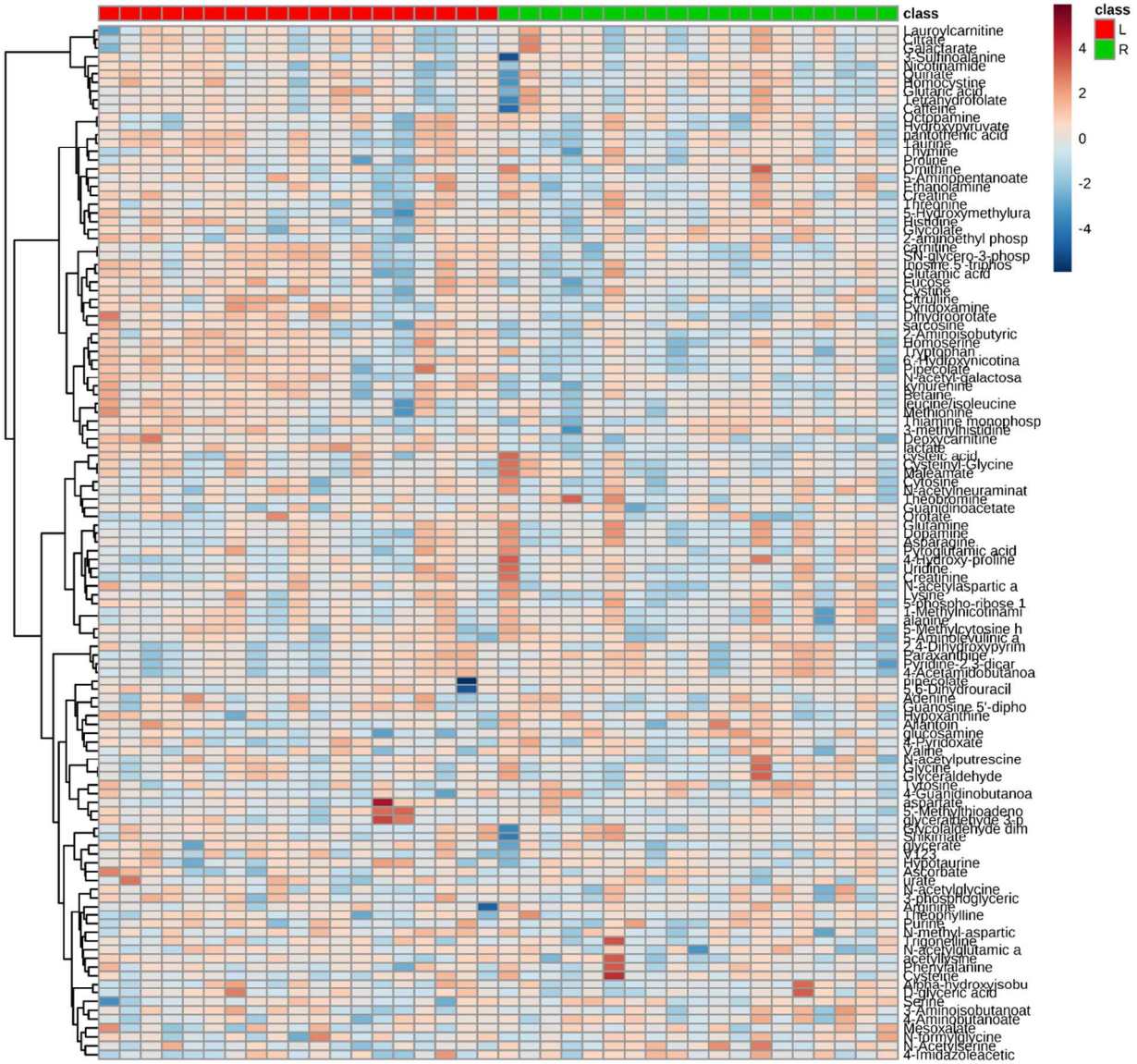
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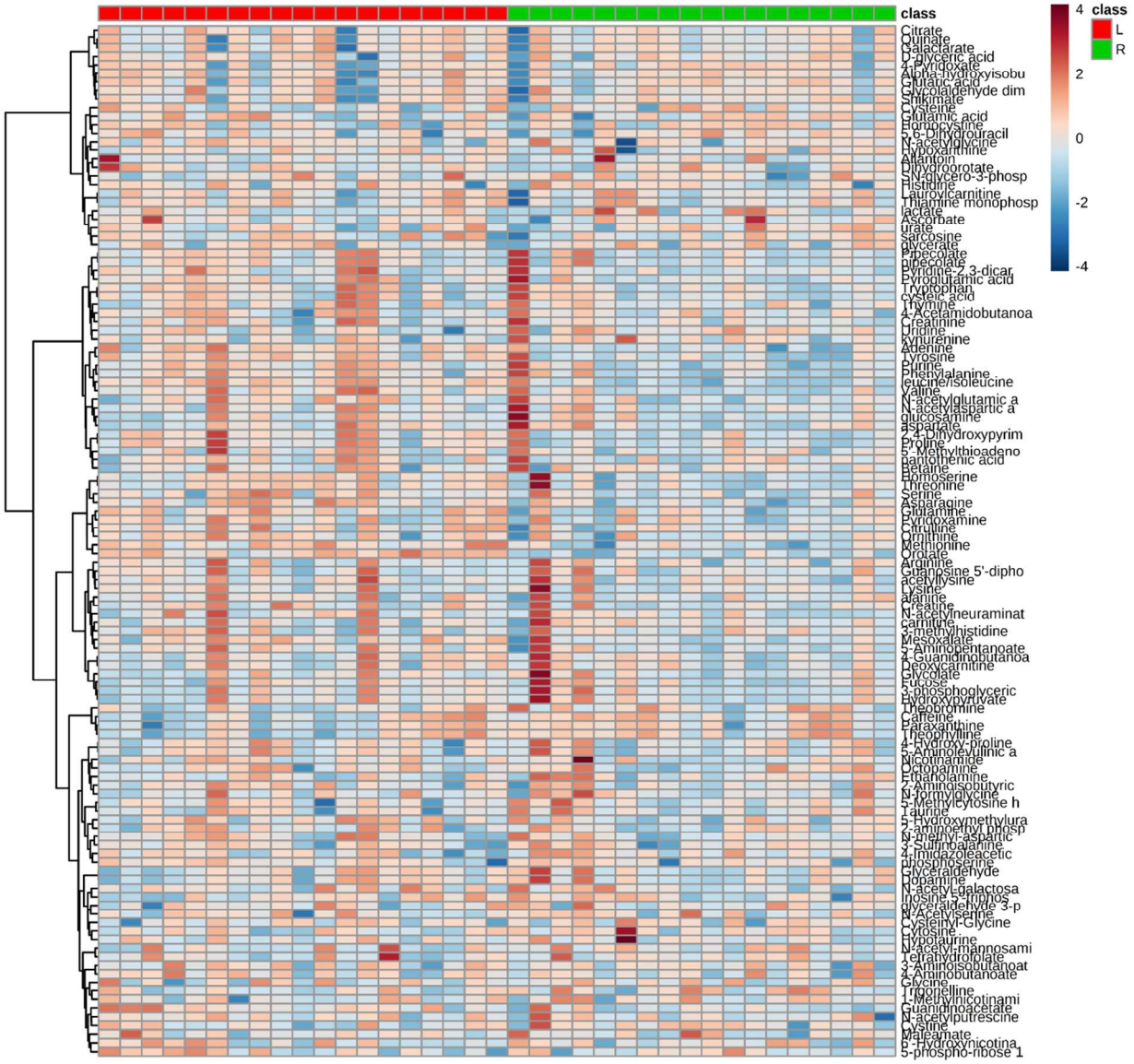
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Betaine
Homoserine
Threonine
Serine
Asparagine
Glutamine
Pyridoxamine
Citrulline
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Caffeine
Paraxanthine
Theophylline
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Glyceraldehyde
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N-acetyl-galactosa
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Hypotaurine
N-acetyl-mannosami
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5-phospho-ribose 1

Figure S7

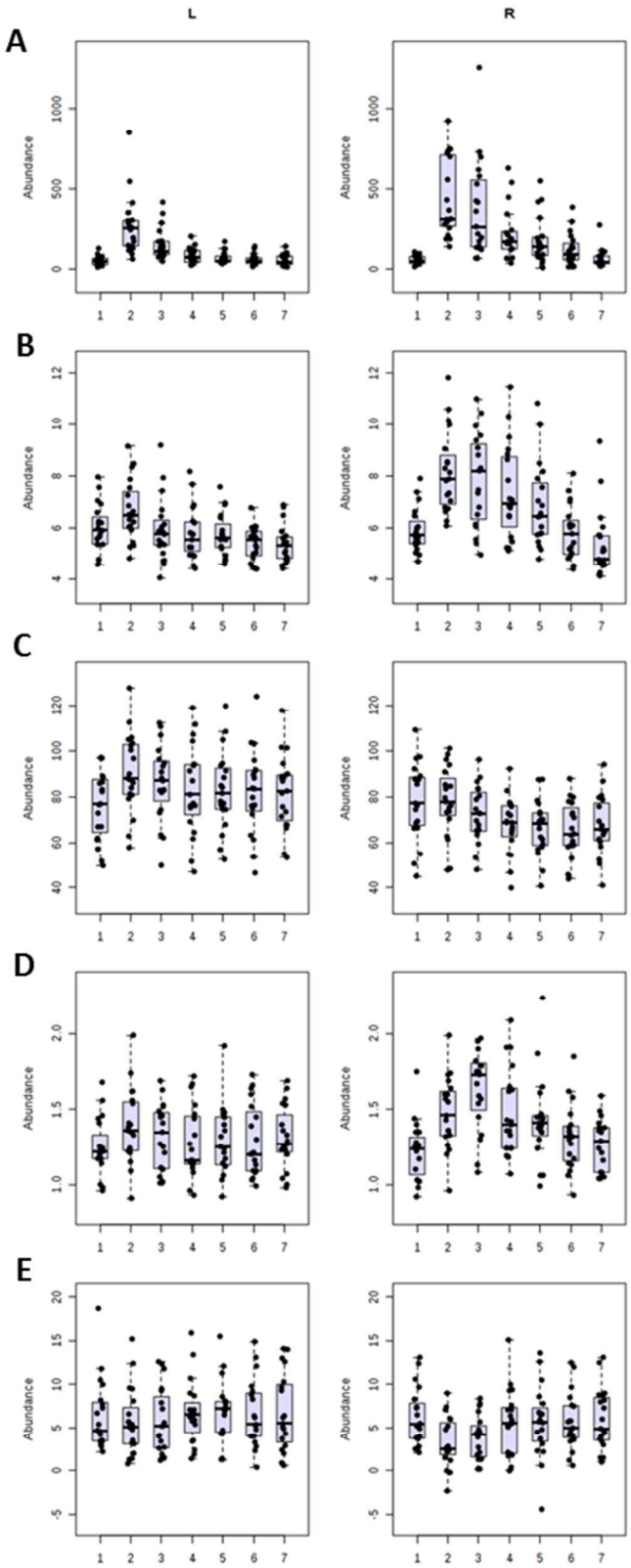

Figure S8

References:

1. Mah, E.; Noh, S. K.; Ballard, K. D.; Matos, M. E.; Volek, J. S.; Bruno, R. S., Postprandial Hyperglycemia Impairs Vascular Endothelial Function in Healthy Men by Inducing Lipid Peroxidation and Increasing Asymmetric Dimethylarginine:Arginine. *The Journal of Nutrition* **2011,** *141* (11), 1961-1968.