Supplementary Data, Tables S1-5

Significant fold changes and decreases/increases of metabolites after a bout of exercise in 57 experiments. This table combines the results from the graphs (31 studies with fold-changes reported, **c)**) and from 26 experiments that only reported if the metabolite decreased or increased after exercise. The summary is described in columns **d)** and **e)**.

Table S1. Carbohydrate Metabolites and TCA cycle intermediates

a) Pathway	**b)** Metabolite	**c)** In 31 experiments n changes were reported.			**d)** In all 57 experiments n increases were reported		**e)** In all 57 experiments n decreases were reported	
		MFC	SD	n	n	References	n	References
Carbohydrate Metabolism	Lactate	25.01	49.35	13	28 ↑	Pechlivanis, 2015 (2); Hall, 2016; Messier, 2017; Mukherjee, 2014 (2); Pechlivanis, 2010 (2); Berton, 2016 (3); Enea, 2010; Lewis 2010 (5); Coelho, 2016 (2); Muhsen, 2016; Danaher, 2015 (3); Valerio, 2017 (2); Zafeiridis, 2016; Sun, 2017; Peake, 2014	-	
	Glycerol	9.32	8.03	2	8 ↑	Nieman, 2015 (2); Messier, 2017 (2); Lewis, 2010 (3); Zafeiridis, 2016	-	
	Pyruvate	4.66	2.30	11	19 ↑	Daskalaki, 2015 (2); Pechlivanis, 2015; Mukherjee, 2014 (2); Pechlivanis, 2010 (2); Berton, 2016 (2); Enea, 2010; Lewis, 2010 (5); Valerio, 2017 (2); Zafeiridis, 2016; Sun, 2017	-	
	Glucose-6-phosphate	-	-	-	4 ↑	Ra, 2014; Lewis, 2010 (3)	-	
	Glucose	1.32	-	1	3 ↑	Breit, 2015; Zauber, 2012; Zafeiridis, 2016	1 ↓	Messier, 2017
	Myo-inositol	1.29	0.00	1	2 ↑	Karl, 2017; Zauber, 2012	-	
	Erythronate	-	-	-	-		2 ↓	Danaher, 2015 (2)
	Formate	0.72	0.21	5	-		6 ↓	Pechlivanis, 2015; Mukherjee, 2014 (2); Pechlivanis, 2010 (2); Sun, 2017

	Fructose	-	-	-	2 ↑	Zauber, 2012 (2)	-	
	Mannitol	-	-	-	2 ↑	Zauber, 2012 (2)	-	
	Isomaltose	-	-	-	2 ↑	Zauber, 2012 (2)	-	
	Beta-D-Methylglucopyranoside	-	-	-	2 ↑	Chorell, 2011 (2)	-	
	Rhamnose or isomer	0.51	0.23	2	-		3 ↓	Muhsen, 2016; Howe, 2018; Prado, 2017
TCA cycle	Malate	1.96	0.30	3	13 ↑	Peake, 2014 (3); Zauber, 2012; Chorell, 2011; Lewis, 2010 (5); Danaher, 2015 (3)	-	
	Fumarate	1.94	0.47	5	11 ↑	Pechlivanis, 2015; Mukherjee, 2014 (2); Pechlivanis, 2010 (2); Lewis, 2010 (5); Sun, 2018	-	
	Succinate	1.75	1.13	9	16 ↑	Pechlivanis, 2010 (2); Berton, 2016; Valerio, 2017; Peake, 2014 (2); Hall, 2016; Messier, 2017 (2); Enea, 2010; Lewis, 2010 (5); Zafeiridis, 2016	3 ↓	Pechlivanis, 2015; Mukherjee, 2014 (2)
	Aconitate	1.7	0.08	2	5 ↑	Peake, 2014 (2); Lewis, 2010 (3)	-	
	Itaconate	1.55	0.28	2	2 ↑	Peake, 2014 (2)	-	
	Alpha-Ketoglutarate	1.21	0.08	2	4 ↑	Pechlivanis, 2010 (2); Zafeiridis, 2016; Lewis, 2010	-	
	Citrate	0.93	0.59	4	10 ↑	Peake, 2014 (HIT); Zauber, 2012 (2); Chorell, 2011; Lewis, 2010 (3); Danaher, 2015 (2); Zafeiridis, 2016	4 ↓	Pechlivanis, 2015; Pechlivanis, 2010 (2); Sun, 2018

Table S2. Lipids and lipid metabolism.

a) Pathway	**b)** Metabolite	**c)** In 31 experiments n changes were reported.			**d)** In all 57 experiments n increases were reported		**e)** In all 57 experiments n decreases were reported	
		MFC	SD	n	n	References	n	References
Fatty acid, Dicarboxylate	Malonate (3:0)	1.46	0.46	2	2 ↑	Mukherjee, 2014 (2)	-	
	Decanedioate (10:0)	11.18	6.96	3	3 ↑	Howe, 2018; Nieman, 2015 (2)	1 ↓	Prado, 2017
	Dodecanedioate (12:0)	10.28	6.03	5	5 ↑	Howe, 2018; Nieman, 2015 (2); Nieman, 2013 (2)	-	
	Tetra-Decanedioate (14:0)	8.95	6.15	5	5 ↑	Howe, 2018; Nieman, 2015 (2); Nieman, 2013 (2)	1 ↓	Prado, 2017
	Hexadecanedioate (16:0)	9.84	5.94	4	4 ↑	Nieman, 2015 (2); Nieman, 2013 (2)	1 ↓	Prado, 2017
	Octadecanedioate (18:0)	3.58	2.52	2	2 ↑	Nieman, 2013 (2)	-	
Fatty acid, Monohydroxy	3-Hydroxydecanedioate	11.43	9.91	3	3 ↑	Karl, 2017; Nieman, 2015 (2)	1 ↓	Prado, 2017
	3-Hydroxydodecanedioate	8.10	2.98	2	2 ↑	Nieman, 2015 (2)	-	
	3-Hydroxytetradecanedioic acid	1.30	-	1	1 ↑	Karl, 2017	1 ↓	Prado, 2017
	3-Hydroxydecanoate	5.60	0.87	2	2 ↑	Nieman, 2015 (2)	1 ↓	Prado, 2017
	CH2 fatty acids (δ 1.29; δ 1.57)	-	-	-	-		2 ↓	Messier, 2017 (2)
	Fatty acids (δ 2.01)	-	-	-	1 ↑	Hall, 2016	2 ↓	Messier, 2017 (2)
Short chain fatty acids	Butyrate (4:0)	-	-	-	1 ↑	Prado, 2017	1 ↓	Chorell, 2011
Medium chain fatty acids	Hexanoate (6:0)	1.41	-	1	1 ↑	Karl, 2017	-	
	Octanoate (8:0)	1.77	-	1	1 ↑	Karl, 2017	1 ↓	Prado, 2017

	Dodecanoate (12:0)	3.26	1.31	8	8 ↑	Karl, 2017; Nieman, 2015 (2); Peake, 2014 (5)	2 ↓	Danaher, 2015 (2)
Long chain, very long chain and polyunsaturated fatty acids	Tetradecanoate (14:0)	3.22	2.32	12	12 ↑	Karl, 2017; Nieman, 2015 (3); Nieman, 2013 (2); Peake, 2014 (6)	-	
	Pentadecanoate (15:0)	2.62	0.81	2	2 ↑	Karl, 2017; Howe, 2018	1 ↓	Prado, 2017
	Hexadecanoate (16:0)	2.20	-	1	2 ↑	Karl, 2017; Prado, 2017	2 ↓	Danaher, 2015 (2)
	Heptadecanoate (17:0)	4.13	2.35	6	6 ↑	Karl, 2017; Nieman, 2015 (3); Nieman, 2013 (2)	-	
	Octadecanoate (18:0)	1.80	-	1	1 ↑	Karl, 2017	2 ↓	Danaher, 2015 (2)
	Docosanoate (22:0)	1.51	-	1	2 ↑	Karl, 2017; Prado, 2017	-	
	Oleate (18:1)	3.58	2.92	6	6 ↑	Karl, 2017; Howe, 2018; Nieman, 2013 (2); Peake, 2014 (2)	-	
	Eicosenoate (20:1)	5.73	3.31	6	6 ↑	Karl, 2017; Nieman, 2015 (3); Nieman, 2013 (2)	1 ↓	Prado, 2017
	Linoleate (alpha or gamma)	2.85	1.09	3	3 ↑	Karl, 2017; Peake, 2014 (2)	-	
	Linoleate (18:2)	4.26	1.99	4	4 ↑	Karl, 2017; Howe, 2018; Nieman, 2013 (2)	1 ↓	Chorell, 2011
	Linolenate (18:3n3)	5.6	2.73	5	5 ↑	Howe, 2018; Nieman, 2015 (2); Nieman, 2013 (2)	-	
	Stearidonate (18:4n3)	5.58	3.28	5	5 ↑	Karl, 2017; Nieman, 2015 (2); Nieman, 2013 (2)	-	
	Dihomo-linolenate (20:3n3 or n6)	2.06	0.71	3	3 ↑	Karl, 2017; Nieman, 2013 (2)	-	
	Eicosapentaenoate (EPA; 20:5n3)	2.32	0.99	3	3 ↑	Karl, 2017; Nieman, 2013 (2)	-	
	Docosapentaenoate (n3 DPA; 22:5n3)	5.14	2.46	6	6 ↑	Karl, 2017; Howe, 2018; Nieman, 2015 (2); Nieman, 2013 (2)	1 ↓	Prado, 2017

	Docosahexaenoate (DHA; 22:6n3)	2.7	1.09	4	4 ↑	Karl, 2017; Howe, 2018; Nieman, 2013 (2)	-	
	9-Tetradecaenoate (14:1n5)	8.06	6.90	6	6 ↑	Karl, 2017; Nieman, 2015 (2); Nieman, 2013 (2); Peake, 2014	-	
	Dihomo-linoleate (20:2n6)	5.71	3.47	6	6 ↑	Karl, 2017; Nieman, 2015 (3); Nieman, 2013 (2)	-	
	Docosadienoate (22:2n6)	4.27	2.58	3	3 ↑	Karl, 2017; Nieman, 2013 (2)	-	
	5-Dodecenoate (12:1n7)	6.55	2.35	3	3 ↑	Karl, 2017; Nieman, 2015 (2)	1 ↓	Prado, 2017
	13,16,19-Docosatrienoate	6.97	0.78	2	2 ↑	Nieman, 2015 (2)	-	
	9-Hexadecenoate (16:1n7)	8.23	11.81	13	13 ↑	Karl, 2017; Howe, 2018; Nieman, 2015 (3); Nieman, 2013 (2); Peake, 2014 (6)	1 ↓	Prado, 2017
	10-Heptadecenoate (17:1n7)	7.01	5.84	5	5 ↑	Nieman, 2015 (3); Nieman, 2013 (2)	-	
	10-Nonadecenoate (19:1n9)	6.53	4.79	5	5 ↑	Nieman, 2015 (3); Nieman, 2013 (2)	-	
	CH3 fatty acids (d 0.9)	-	-	-	-		2 ↓	Messier, 2017 (2)
	Double bond fatty acids (δ 5.32)	-	-	-	-		2 ↓	Messier, 2017 (2)

Table S2 continued

a) Pathway	**b)** Metabolite	**c)** In 31 experiments n changes were reported.			**d)** In all 57 experiments n increases were reported		**e)** In all 57 experiments n decreases were reported	
		MFC	SD	n	n	Reference	n	Reference
Acylcarnitines	Acetylcarnitine (2:0)	2.66	0.98	2	4 ↑	Breit, 2015; Howe, 2018; Prado, 2017; Hall, 2016	-	

	Propionylcarnitine (3:0)	0.89	0.75	2	1 ↑	Howe, 2018	1 ↓	Muhsen, 2016
	Butyrylcarnitine (4:0)	1.52	0.36	2	2 ↑	Breit, 2015; Howe, 2018	1 ↓	Prado, 2017
	Pentanoylcarnitine (5:0)	1.86	0.67	2	2 ↑	Daskalaki, 2015; Breit, 2015	-	
	Hexanoylcarnitine (6:0)	4.31	2.91	5	7 ↑	Daskalaki, 2015; Nieman, 2015 (2); Nieman, 2013 (2); Lehmann, 2010	-	
	Octanoylcarnitine (8:0)	5.59	3.37	5	7 ↑	Howe, 2018; Nieman, 2015 (2); Nieman, 2013 (2); Lehmann, 2010 (2)	-	
	Octenoylcarnitine (8:1)	6.01	-	1	2 ↑	Lehmann, 2010; Howe, 2018	-	
	Nonanoylcarnitine (9:0)	8.11	9.16	2	2 ↑	Muhsen, 2016; Howe, 2018	-	
	Decanoylcarnitine (10:0)	4.96	4.18	7	9 ↑	Daskalaki, 2015; Muhsen, 2016; Howe, 2018; Nieman, 2015 (2); Nieman, 2013 (2); Lehmann, 2010 (2)	1 ↓	Prado, 2017
	Decenoylcarnitine, cis-4 (10:1)	4.70	2.66	5	5 ↑	Howe, 2018; Nieman, 2015 (2); Nieman, 2013 (2)	-	
	Dodecanoylcarnitine (12:0)	8.62	6.06	4	4 ↑	Nieman, 2015 (2); Nieman, 2013 (2)	-	
	Dodecenoylcarnitine (12:1)	5.48	3.02	3	5 ↑	Daskalaki, 2015 (2); Howe, 2018; Lehmann, 2010 (2)	1 ↓	Prado, 2017
	Tetradecanoylcarnitine (14:0)	12.25	4.93	3	4 ↑	Lehmann, 2010; Howe, 2018; Nieman, 2015 (2)	-	
	Tetradecenoylcarnitine/isomer (14:1)	8.00	1.71	3	4 ↑	Lehmann, 2010; Howe, 2018; Nieman, 2015 (2)	-	
	6-Ketodecanoylcarnitine (17:0)	7.37	8.14	2	2 ↑	Muhsen, 2016; Howe, 2018	-	
	Oleoylcarnitine (18:1)	4.73	1.51	2	2 ↑	Nieman, 2015 (2)	-	
	Linoleoylcarnitine (18:2)	4.32	1.98	2	2 ↑	Nieman, 2015 (2)	-	
	Arachidonoylcarnitine (20:4)	0.39	0.00	1	1 ↑	Prado, 2017	1 ↓	Howe, 2018
	Isovalerylcarnitine	1.60	1.34	2	2 ↑	Nieman, 2013; Prado, 2017	1 ↓	Nieman, 2013

	Dehydroxycarnitine	2.33	0.62	2	2 ↑	Daskalaki, 2015 (2)	-	

Table S2 continued.

a) Pathway	**b)** Metabolite	**c)** In 31 experiments n changes were reported.			**d)** In all 57 experiments n increases were reported		**e)** In all 57 experiments n decreases were reported	
		MFC	SD	n			MFC	SD
Ketone Bodies	3-Hydroxybutyrate	7.48	10.89	8	6 ↑	Pechlivanis, 2015; Karl, 2017; Nieman, 2015 (3); Peake, 2014	2 ↓	Mukherjee, 2014 (2)
	Acetoacetate	6.03	8.46	5	3 ↑	Karl, 2017; Nieman, 2013 (2)	2 ↓	Valerio, 2017 (2)
	3-Hydroxyisobutyrate	1.59	0.49	9	8 ↑	Pechlivanis, 2015; Mukherjee, 2014 (2); Pechlivanis, 2010 (2); Berton, 2016 (2); Nieman, 2013	1 ↓	Nieman, 2013
	2-Hydroxybutyrate	1.97	0.53	12	13 ↑	Pechlivanis, 2015; Mukherjee, 2014 (2); Pechlivanis, 2010 (2); Berton, 2016 (2); Peake, 2014 (5); Coelho, 2016	-	
	Hydroxypentanoate	2.06	0.94	2	2 ↑	Daskalaki, 2015; Howe, 2018	-	
	2-Oxoisocaproate	1.61	0.34	8	8 ↑	Pechlivanis, 2015; Mukherjee, 2014 (2); Pechlivanis, 2010 (2); Berton, 2016 (3)	1 ↓	Prado, 2017
	Acetate	1.5	0.30	2	4 ↑	Pechlivanis, 2015 (2); Samudrala, 2015; Enea, 2010	1 ↓	Prado, 2017
	Acetone (2-Propanone)	-	-	-	-		2 ↓	Messier, 2017 (2)
Catabolism of ketogenic amino acids	6-Acetamido-3-oxohexanoate	2.77	2.04	2	2 ↑	Mukherjee, 2014 (2)	1 ↓	
	3-Methyl-2-oxovalerate	1.57	0.45	5	5 ↑	Pechlivanis, 2015; Mukherjee, 2014 (2) Pechlivanis, 2010 (2)	-	
	2-Oxoisovalerate	1.23	0.11	5	5 ↑	Pechlivanis, 2015; Mukherjee, 2014 (2); Pechlivanis, 2010 (2)	-	
	3-Hydroxy-3-methylglutarate	1.65	0.00	1	1 ↑	Karl, 2017	1 ↓	Prado, 2017
	2-Aminoadipate	2.12	1.90	2	1 ↑	Nieman, 2013	1 ↓	Nieman, 2013
Ketogenic amino acids	Isoleucine*	0.66	0.16	7	3 ↑	Ra, 2014; Lewis, 2010 (2)	9 ↓	Pechlivanis, 2015; Berton, 2016; Howe, 2018; Peake, 2014

								(4); Messier, 2017; Lewis, 2010 (2)
	Leucine*	0.65	0.13	6	4 ↑	Ra, 2014; Lewis, 2010 (2); Sun, 2018	10 ↓	Berton, 2016; Muhsen, 2016; Howe, 2018; Peake, 2014 (3); Prado, 2017; Messier, 2017; Lewis, 2010; Coelho, 2016
	Lysine*	0.76	0.37	3	2 ↑	Breit, 2015; Chorell, 2011	5 ↓	Berton, 2016; Howe, 2018; Lewis, 2010; Coelho, 2016; Danaher, 2015

*****duplicates of Table S3 (Amino Acids and Peptides)

Table S2 continued.

a) Pathway	**b)** Metabolite	**c)** In 31 experiments n changes were reported.			**d)** In all 57 experiments n increases were reported		**e)** In all 57 experiments n decreases were reported	
		MFC	SD	n			MFC	SD
Glycero-phospho-lipids /Sphingo-lipids	1-Palmitoyl-GPE (16:0)	0.55	0.11	3	-	-	3 ↓	Karl, 2017; Nieman, 2013 (2)
	1-Oleoyl-GPE (18:1)	0.52	0.14	3	-	-	3 ↓	Karl, 2017; Nieman, 2013 (2)
	2-Linoleoyl-GPE (18:2)	0.32	0.10	2	-	-	2 ↓	Nieman, 2013 (2)
	1-Arachidonoyl-GPE (20:4n6)	0.62	0.24	3	-		3 ↓	Karl, 2017; Nieman, 2013 (2)
	Sphingosine-1-phosphate	0.81	-	1	1 ↑	Prado, 2017	1 ↓	Karl, 2017
Steroids	11b-Hydroxyandrost-4-ene-3,17-dione	3.93	2.28	2	2 ↑	Nieman, 2015 (2)	-	
	Andro steroid monosulfate	1.66	-	1	1 ↑	Karl, 2017	1 ↓	Prado, 2017
	Cortisone	1.35	0.61	2	1 ↑	Howe, 2018	1 ↓	Karl, 2017

	Etiocholanolone glucuronide	0.91	-	1	1 ↑	Prado, 2017	1 ↓	Karl, 2017
	Androstenediol (3alpha, 17alpha) monsulfate	0.57	-	1	-		2 ↓	Karl, 2017; Prado, 2017
	Cholestane-tetrol-glucuronide	0.58	0.12	3	-		3 ↓	Mukherjee, 2014 (2); Howe, 2018
Bile Acids	Cholate	0.86	1.48	4	-		4 ↓	Karl, 2017; Muhsen, 2016; Nieman, 2013 (2)
	Glycocholate	0.63	1.18	3	-		3 ↓	Howe, 2018; Nieman, 2013 (2)
	Taurocholate	0.69	1.16	3	-		3 ↓	Howe, 2018; Nieman, 2013 (2)
	Glycochenodeoxycholate	0.52	0.80	2	-		2 ↓	Nieman, 2013 (2)
	Glycochenodeoxycholate glucuronide	0.60	0.47	2	1 ↑	Prado, 2017	1 ↓	Karl, 2017
	Deoxycholate	0.30	0.42	1	-		1 ↓	Karl, 2017
	Glycodeoxycholate	0.49	0.81	2	-		2 ↓	Nieman, 2013 (2)
	Taurodeoxycholate	0.54	0.79	2	-		2 ↓	Nieman, 2013 (2)
	Taurolithocholate 3-sulfate	1.89	-	1	2 ↑	Karl, 2017; Prado, 2017	-	

Table S3. Amino Acids and Peptides

a)	**b)**	**c)**			**d)**		**e)**	
Pathway	Metabolite	In 31 experiments n changes were reported.			In all 57 experiments n increases were reported		In all 57 experiments n decreases were reported	
		MFC	SD	n			MFC	SD

Glucogenic amino acids	Alanine	1.30	0.45	14	24 ↑	Breit, 2015; Pechlivanis, 2015 (BL); Mukherjee, 2014 (2) Pechlivanis, 2010 (2); Berton, 2016 (3); Valerio, 2017; Peake, 2014; Ra, 2014; Zauber, 2012; Enea, 2010; Lewis, 2010 (4); Chorell, 2011 (2); Danaher, 2015 (2), Zafeiridis, 2016; Sun, 2018	4 ↓	Howe, 2018; Peake, 2014 (2); Messier, 2017
	Asparagine	0.63	-	1	1 ↑	Chorell, 2011	5 ↓	Hooton, 2016; Prado, 2017; Lewis, 2010; Danaher, 2015 (2)
	Aspartate	0.88	-	1			1 ↓	Breit, 2015
	Arginine	1.36	0.00	1	1 ↑	Breit, 2015	3 ↓	Coelho, 2016 (2); Lewis, 2010
	Glutamate	1.04	0.48	3	3 ↑	Breit, 2015; Peake, 2014; Zauber, 2012	3 ↓	Howe, 2018; Coelho, 2016; Danaher, 2015
	Glutamine	0.71	-	1	5 ↑	Zauber, 2012; Lewis, 2010 (4)	5 ↓	Howe, 2018; Messier, 2017; Lewis, 2010; Coelho, 2016; Zafeiridis, 2016
	Glycine	0.78	0.17	9	4 ↑	Breit, 2015; Prado, 2017; Ra, 2014; Hall, 2016	8 ↓	Pechlivanis, 2015 (2); Mukherjee, 2014 (2); Pechlivanis, 2010 (2); Howe, 2018; Sun, 2018
	Histidine	0.74	0.31	4	1 ↑	Breit, 2015	4 ↓	Daskalaki, 2015; Pechlivanis, 2010 (2); Lewis, 2010
	Methionine	0.93	0.68	7	6 ↑	Daskalaki, 2015; Breit, 2015; Prado, 2017; Lewis, 2010 (2); Coelho	5 ↓	Muhsen, 2016; Howe, 2018; Peake, 2014 (3)
	Proline	1.33	1.46	5	3 ↑	Daskalaki, 2015; Breit, 2015; Lewis, 2010	5 ↓	Howe, 2018; Peake, 2014 (2); Zauber, 2012; Zafeiridis, 2016
	Serine	0.81	0.42	2	1 ↑	Breit, 2015	5 ↓	Howe, 2018; Lewis, 2010 (4)
	Valine	0.86	0.18	10	3 ↑	Breit, 2015; Mukherjee, 2014; Ra, 2014	11 ↓	Pechlivanis, 2015 (2); Mukherjee, 2014; Berton, 2016; Howe, 2018;

								Peake, 2014 (3); Prado, 2017; Messier, 2017; Lewis, 2010
Glucgenic and ketogenic amino acids	Isoleucine	0.66	0.16	7	3 ↑	Ra, 2014; Lewis, 2010 (2)	9 ↓	Pechlivanis, 2015; Berton, 2016; Howe, 2018; Peake, 2014 (4); Messier, 2017; Lewis, 2010 (2)
	Phenylalanine	0.94	0.12	4	2 ↑	Daskalaki, 2015; Ra, 2014	3 ↓	Karl, 2017; Mukherjee, 2014; Peake, 2014
	Threonine	0.65	0.44	3	2 ↑	Breit, 2015; Chorell, 2011	4 ↓	Muhsen, 2016; Howe, 2018; Chorell, 2011; Lewis, 2010
	Tryptophan	1.02	0.47	7	4 ↑	Daskalaki, 2015; Breit, 2015; Ra, 2014; Chorell, 2011	8 ↓	Mukherjee, 2014 (2); Pechlivanis, 2010 (2); Howe, 2018; Prado, 2017; Chorell, 2012; Lewis, 2010
	Tyrosine	0.91	0.23	5	2 ↑	Breit, 2015; Peake, 2014	3 ↓	Pechlivanis, 2015; Howe, 2018; Peake, 2014
Ketogenic amino acids	Leucine	0.65	0.13	6	4 ↑	Ra, 2014; Lewis, 2010 (2); Sun, 2018	10 ↓	Berton, 2016; Muhsen, 2016; Howe, 2018; Peake, 2014 (3); Prado, 2017; Messier, 2017; Lewis, 2010; Coelho, 2016
	Lysine	0.76	0.37	3	2 ↑	Breit, 2015; Chorell, 2011	5 ↓	Berton, 2016; Howe, 2018; Lewis, 2010; Coelho, 2016; Danaher, 2015
Other amino acids	Citruline	0.90	0.32	2	1 ↑	Breit, 2015	4 ↓	Howe, 2018; Lewis, 2010 (3)
	Ornithine	0.81	0.34	3	4 ↑	Breit, 2015; Zauber, 2012; Chorell, 2012; Coelho, 2016	5 ↓	Berton, 2016; Howe, 2018; Lewis, 2010 (3)
	Beta-alanine	0.84	-	1	1 ↑	Chorell, 2011	1 ↓	Karl, 2017
	O-Acetyl-L-homoserine	2.41	1.69	3	2 ↑	Daskalaki, 2015 (2)	1 ↓	Howe, 2018
	3-Hydroxytryptophan	1.94	1.08	2	2 ↑	Daskalaki, 2015; Karl, 2017	1 ↓	Prado, 2017
	Phenylacetylglycine	1.76	0.00	1	2 ↑	Coelho, 2016; Prado, 2017	-	
	Trimethylamin n-oxide	0.83	0.04	6	-		6 ↓	Pechlivanis, 2015 (2); Mukherjee, 2014 (2); Pechlivanis, 2010 (2)

	Glutarate	-	-	-	1 ↑	Zauber, 2012	1 ↓	Prado, 2017
	Cysteine	-	-	-	1 ↑	Prado, 2017	2 ↓	Lewis, 2010 (2)
	Cystine	-	-	-	-		1 ↓	Prado, 2017
Biogenic amines	Creatine	0.54	-	1	2 ↑	Lewis, 2010; Coelho, 2016	2 ↓	Prado, 2017; Muhsen, 2016
	Creatinine	0.60	0.20	3	4 ↑	Prado, 2017; Zauber, 2012; Lewis, 2010; Sun, 2018	3 ↓	Peake, 2014 (2); Pechlivanis, (2015)
	Histamine	0.50	-	1	1 ↑	Prado, 2017	1 ↓	Hooton, 2016
	Kynurenate	2.32	0.00	1	2 ↑	Howe, 2018; Lewis, 2010	-	
	Taurine	0.57	0.00	1	3 ↑	Ra, 2014; Chorell, 2011; Coelho, 2016	3 ↓	Howe, 2018; Prado, 2017; Sun, 2018
	Aniline	5.37	0.65	2	2 ↑	Nieman, 2015 (2)	-	
	Urocanate	1.31	0.97	2	1 ↑	Daskalaki, 2015	1 ↓	Howe, 2018
	Betaine	0.51	-	1	-		2 ↓	Howe, 2018; Lewis, 2010
	Choline	0.92	0.04	3	-	-	3 ↓	Karl, 2017; Valerio, 2017 (2)
Amino acid metabolism	Imidazoleacetate	0.61	-	1	-	-	2 ↓	Hooton, 2016; Prado, 2017
	N-acetylphenylalanine	1.54	1.39	2	1 ↑	Nieman, 2013	1 ↓	Nieman, 2013
	5-Hydroxyindolepyruvate	3.68	1.64	3	3 ↑	Daskalaki, 2015 (2); Howe, 2018	-	
	4-Hydroxyphenylpyruvate	2.53	1.6	3	3 ↑	Daskalaki, 2015; Lewis, 2010, Nieman, 2013	1 ↓	Nieman, 2013
	Xanthurenate	3.25	1.91	2	2 ↑	Daskalaki, 2015 (2)	-	
	Hydroxyphenyllactate	0.54	0.00	1	-		2 ↓	Howe, 2018; Prado, 2017

	Hexanoylglycine	6.61	0.05	2	2 ↑	Nieman, 2015 (2)	-	
	4-Aminohippurate	0.63	-	1	-		2 ↓	Pechlivanis, 2015; Prado, 2017
	3-Phenyllactic acid	-	-	-	1 ↑	Zauber, 2012	1 ↓	Prado, 2017
Catecholamine	L-Metanephrine	3.30	1.84	2	2 ↑	Daskalaki, 2015 (2)	-	
	N-Acetylvanilalanine	5.35	3.04	2	2 ↑	Daskalaki, 2015 (2)	-	
Urea cycle metabolites	N-(Carboxyethyl) arginine	4.30	1.27	2	2 ↑	Daskalaki, 2015 (2)	-	
	Argininosuccinate	0.61	0.21	2	1 ↑	Lewis, 2010	2 ↓	Muhsen, 2016; Howe, 2018
	Pyrrole-2-carboxylate	0.41	0.00	1	1 ↑	Prado, 2017	1 ↓	Danaher, 2015
Peptides	Cystathione	-	-	-	-	-	2 ↓	Lewis, 2010 (2)
	Glycylproline	0.69	0.02	3	-	-	3 ↓	Hooton, 2016; Karl, 2017; Danaher, 2015
	Glycyl-L-leucine	0.6	0.06	2	-	-	3 ↓	Hooton, 2016; Danaher, 2015; Prado, 2017

Table S4. Nucleotides

a) Pathway	**b)** Metabolite	**c)** In 31 experiments n changes were reported.	**d)** In all 57 experiments n increases were reported	**e)** In all 57 experiments n decreases were reported

		MFC	SD	n			MFC	SD
Purine Metabolism	Inosine	69.62	191.84	9	14 ↑	Daskalaki, 2015 (2); Pechlivanis, 2015 (3); Karl, 2017; Mukherjee, 2014 (2); Lewis, 2010 (4); Muhsen, 2016; Sun, 2017	-	
	Deoxyinosine	21.29	19.79	3	3 ↑	Daskalaki, 2015 (2); Muhsen, 2016	-	
	Hypoxanthine	9.77	7.24	13	22 ↑	Daskalaki, 2015 (2); Prado, 2017; Pechlivanis, 2015 (3); Mukherjee, 2014 (2); Pechlivanis, 2010 (2); Berton, 2016 (2); Chorell, 2011; Enea, 2010; Lewis, 2010 (5); Muhsen, 2016; Howe, 2018; Sun, 2017	-	
	Xanthosine	8.92	6.95	3	6 ↑	Daskalaki, 2015 (2); Lewis 2010 (3); Muhsen, 2016	1 ↓	Prado, 2017
	N2-N2-Dimethylguanosine	1.84	1.06	2	2 ↑	Daskalaki, 2015; Karl, 2017	-	
	Urate	1.02	0.38	2	3 ↑	Karl, 2017; Lewis, 2010; Coelho, 2016	1 ↓	Muhsen, 2016
	N6-methyladenosine	0.72	-	1	1 ↑	Prado, 2017	1 ↓	Karl, 2017
	Adenosine-5-monophosphate (AMP)	-	-	-	5 ↑	Chorell, 2011 (2), Lewis, 2010 (2)	-	
	Xanthine	-	-	-	5 ↑	Lewis, 2010 (5)	-	
	Allantoin	-	-	-	-	-	4 ↓	Lewis, 2010 (4)
Pyrimidine Metabolism	Guanine	3.91	1.25	3	4 ↑	Daskalaki, 2015 (2); Prado, 2017; Muhsen, 2016	-	
	Cytidine	1.32	-	1	2 ↑	Prado, 2017; Karl, 2017	-	
	Cytidine triphosphate	1.09	0.08	2	2 ↑	Mukherjee, 2014 (2)	1 ↓	Prado, 2017
	Uridine	0.42	-	1	2 ↑	Lewis, 2010 (2)	2 ↓	Howe, 2018; Prado, 2017

Table S5. Cofactors/Vitamins and Xenometabolites

a) Pathway	**b)** Metabolite	**c)** In 31 experiments n changes were reported.			**d)** In all 57 experiments n increases were reported		**e)** In all 57 experiments n decreases were reported	
		MFC	SD	n			MFC	SD
Cofactors or Vitamins	Pantothenate	3.22	1.85	3	8 ↑	Daskalaki, 2015 (2); Muhsen, 2016; Lewis, 2010 (5)	-	-
	Riboflavin	1.84	1.66	2	2 ↑	Daskalaki, 2015; Prado, 2017	1 ↓	Muhsen, 2016
	Alpha-CECH	1.01	0.04	2	1 ↑	Mukherjee, 2014	2 ↓	Mukherjee, 2014; Prado, 2017
	Niacinamide	0.77	0.61	5	1 ↑	Lewis, 2010	4 ↓	Lewis, 2010 (4)
	Gamma-Tocopherol	0.53	-	1	-	-	2 ↓	Howe, 2018; Chorell, 2011
	Threonate	-	-	-	1 ↑	Chorell, 2011	1 ↓	Chorell, 2011
Xenometabolites	Benzoate	1.06	0.40	2	2 ↑	Zauber, 2012; Peake, 2014	2 ↓	Peake, 2014; Prado, 2017
	Hippurate	0.83	0.09	5	1 ↑	Lehmann, 2010;	7 ↓	Pechlivanis, 2015 (3); Mukherjee, 2014 (2); Lewis 2010 (2)
	Gluconate	0.76	-	1	2 ↑	Zauber, 2012 (2)	1 ↓	Karl, 2017
	Acesulfame	0.68	0.52	3	1 ↑	Mukherjee, 2014	2 ↓	Karl, 2017; Mukherjee, 2014
	Quinate	0.32	-	1	2 ↑	Zauber, 2012 (2)	1 ↓	Karl, 2017