

**Supplementary Table 1. Characteristics of Dams.**

Treatment	Sedentary HFD Dam (n=20)	Trained HFD Dam (n=20)
Body weight (g)	41.8±2.3	33.4±0.6**
Running Distance Pre-Pregnancy (km)	0	65±9
Running Distance during gestation (km)	0	74±15
Total Running Distance (km)	0	139±11
OGTT (AUC)	282±13	284±11
Fasting glucose (mg/dL)	175±6	147±7**
Fasting insulin (ng/mL)	1.1±0.2	0.6±0.1*

**Supplementary Table 2. Characteristics of Sires.**

Treatment	Sedentary HFD Sires (n=20)	Trained HFD Sires (n=20)
Body weight (g)	42.8±3.2	33±2.8*
Total Running Distance (km)	0	95±6.3
ipGTT (AUC)	380±22	300±13**
ipITT (AUC)	165±12	122±11*
Fasting glucose (mg/dL)	202±13	165±6*
Fasting insulin (ng/mL)	4.2±0.7	2.6±0.4*

**Supplementary Table 3. Summary of non-significant exercise effects in liver metabolites.**

Metabolite class	Metabolite	SED	MATEX	PATEX	PAREX
Amino acids	Glycine <sup>§</sup>	99.94 ± 17.35	110.79 ± 7.10	90.18 ± 8.44	114.13 ± 5.52
	Alanine <sup>§</sup>	113.45 ± 13.11	117.19 ± 10.75	141.20 ± 11.37	140.37 ± 11.46
	Valine <sup>§</sup>	10.92 ± 0.77	13.13 ± 1.17	12.02 ± 0.61	12.42 ± 0.70
	Methionine <sup>§</sup>	2.07 ± 0.18	2.89 ± 0.40	1.94 ± 0.11	2.72 ± 0.25
	Aspartate/Asparagine <sup>§</sup>	14.42 ± 1.29	17.59 ± 2.38	15.42 ± 1.45	18.10 ± 1.91
	Glutamate/Glutamine <sup>§</sup>	89.75 ± 7.53	124.96 ± 12.56	92.57 ± 15.09	123.10 ± 11.84
Organic acids	Lactate <sup>§</sup>	262.38 ± 24.25	283.92 ± 13.58	301.78 ± 24.69	306.10 ± 27.24
	Succinate <sup>§</sup>	38.20 ± 2.42	38.75 ± 3.49	41.40 ± 2.60	38.86 ± 3.16

	Fumarate <sup>\$</sup>	2.28 ± 0.17	2.31 ± 0.20	2.53 ± 0.19	2.93 ± 0.31
	Malate <sup>\$</sup>	14.76 ± 1.37	16.43 ± 1.70	16.89 ± 1.60	19.38 ± 2.21
	Citrate <sup>\$</sup>	5.61 ± 0.64	5.07 ± 0.44	4.88 ± 0.52	4.47 ± 0.46
Nucleotides	Hypoxanthine <sup>#</sup>	7.83 ± 1.69	8.67 ± 1.27	8.09 ± 1.35	7.62 ± 1.56
	Guanosine <sup>#</sup>	6.98 ± 0.36	7.05 ± 0.44	5.55 ± 0.99	5.36 ± 0.42
	SAH <sup>#</sup>	2.22 ± 0.26	2.64 ± 0.33	2.27 ± 0.29	3.12 ± 0.67
	Adenosine <sup>#</sup>	45.68 ± 4.17	49.26 ± 2.92	36.39 ± 3.57	36.55 ± 3.95
	NAD <sup>#</sup>	713.01 ± 58.31	654.06 ± 53.60	690.58 ± 54.66	655.88 ± 56.37
	UMP <sup>#</sup>	315.00 ± 25.02	297.25 ± 19.82	278.94 ± 22.99	308.01 ± 31.10
	IMP <sup>#</sup>	90.10 ± 15.73	105.96 ± 11.34	117.65 ± 16.33	144.88 ± 25.33
	ADP-ribose <sup>#</sup>	253.50 ± 17.31	240.88 ± 32.96	268.71 ± 37.97	289.77 ± 29.51
	NADH <sup>#</sup>	7.47 ± 3.46	7.66 ± 3.65	7.35 ± 2.81	4.58 ± 2.85
	NADP <sup>#</sup>	70.26 ± 3.99	70.79 ± 6.11	66.95 ± 3.31	60.78 ± 3.43
	UDP <sup>#</sup>	18.15 ± 1.38	19.11 ± 2.25	17.10 ± 1.54	15.67 ± 1.71
	GDP <sup>#</sup>	19.67 ± 1.80	24.50 ± 2.83	19.50 ± 2.77	18.74 ± 1.47
	CTP <sup>#</sup>	8.05 ± 1.49	7.52 ± 1.09	9.28 ± 1.10	5.39 ± 1.00
	UTP <sup>#</sup>	26.65 ± 4.62	27.21 ± 4.41	28.76 ± 2.73	27.39 ± 3.58
	GTP <sup>#</sup>	32.63 ± 5.74	28.69 ± 5.24	34.11 ± 4.05	25.18 ± 2.56
	s-AMP <sup>#</sup>	7.94 ± 1.55	7.77 ± 1.15	5.52 ± 0.78	8.59 ± 0.85
	NADPH <sup>#</sup>	6.88 ± 2.54	5.11 ± 1.44	3.78 ± 1.14	3.60 ± 0.89
Short ACC	C2 <sup>\$</sup>	4.48 ± 0.35	4.61 ± 0.36	5.07 ± 0.41	4.06 ± 0.26
	C3 <sup>\$</sup>	0.1545 ± 0.0039	0.1882 ± 0.0215	0.1817 ± 0.0189	0.1901 ± 0.0199
	C4/Ci4 <sup>\$</sup>	0.8640 ± 0.0910	1.0985 ± 0.2537	1.0919 ± 0.1706	0.8653 ± 0.2416
	C5:1 <sup>\$</sup>	0.0426 ± 0.0038	0.0509 ± 0.0053	0.0461 ± 0.0050	0.0495 ± 0.0036
	C5 <sup>\$</sup>	0.0760 ± 0.0089	0.0789 ± 0.0098	0.0871 ± 0.0087	0.0741 ± 0.0129
	C6 <sup>\$</sup>	0.1047 ± 0.0154	0.1931 ± 0.0589	0.1418 ± 0.0264	0.1512 ± 0.0661
	C5-OH/C3-DC <sup>\$</sup>	0.0500 ± 0.0047	0.0539 ± 0.0024	0.0574 ± 0.0026	0.0545 ± 0.0055
	C4-DC/Ci4-DC <sup>\$</sup>	0.0592 ± 0.0072	0.0373 ± 0.0030	0.0551 ± 0.0125	0.0444 ± 0.0030
	C8:1 <sup>\$</sup>	0.0023 ± 0.0004	0.0024 ± 0.0004	0.0023 ± 0.0004	0.0023 ± 0.0005
	C5-DC <sup>\$</sup>	0.0726 ± 0.0087	0.0973 ± 0.0111	0.0779 ± 0.0094	0.0940 ± 0.0112
	C8:1-OH/C6:1-DC <sup>\$</sup>	0.0201 ± 0.0019	0.0206 ± 0.0024	0.0201 ± 0.0018	0.0184 ± 0.0008
	C6-DC/C8-OH <sup>\$</sup>	0.0644 ± 0.0129	0.1000 ± 0.0082	0.0705 ± 0.0115	0.0897 ± 0.0152
	C10:3 <sup>\$</sup>	0.0025 ± 0.0003	0.0026 ± 0.0005	0.0031 ± 0.0004	0.0031 ± 0.0003
	C10:2 <sup>\$</sup>	0.0023 ± 0.0003	0.0020 ± 0.0005	0.0021 ± 0.0004	0.0022 ± 0.0008
	C10 <sup>\$</sup>	0.0284 ± 0.0055	0.0261 ± 0.0030	0.0210 ± 0.0009	0.0205 ± 0.0016
	C7-DC <sup>\$</sup>	0.0289 ± 0.0071	0.0412 ± 0.0077	0.0253 ± 0.0043	0.0347 ± 0.0062
	C8:1-DC <sup>\$</sup>	0.0094 ± 0.0011	0.0121 ± 0.0013	0.0089 ± 0.0017	0.0104 ± 0.0013

	C10-OH/C8-DC <sup>\$</sup>	0.0112 ± 0.0017	0.0130 ± 0.0012	0.0095 ± 0.0010	0.0108 ± 0.0010
	C12:2 <sup>\$</sup>	0.0029 ± 0.0003	0.0025 ± 0.0004	0.0022 ± 0.0002	0.0021 ± 0.0003
	C12:1 <sup>\$</sup>	0.0109 ± 0.0021	0.0090 ± 0.0011	0.0088 ± 0.0013	0.0078 ± 0.0008
	C12:2-OH/C10:2-DC <sup>\$</sup>	0.0051 ± 0.0006	0.0045 ± 0.0004	0.0042 ± 0.0006	0.0048 ± 0.0012
	C12:1-OH/C10:1-DC <sup>\$</sup>	0.0049 ± 0.0006	0.0049 ± 0.0006	0.0047 ± 0.0005	0.0051 ± 0.0007
	C12-OH/C10-DC <sup>\$</sup>	0.0049 ± 0.0006	0.0043 ± 0.0005	0.0057 ± 0.0003	0.0042 ± 0.0006
	C14:3 <sup>\$</sup>	0.0020 ± 0.0003	0.0014 ± 0.0001	0.0019 ± 0.0002	0.0020 ± 0.0003
	C14:2-OH/C12:2-DC <sup>\$</sup>	0.0023 ± 0.0004	0.0033 ± 0.0004	0.0031 ± 0.0006	0.0042 ± 0.0011
	C14:1-OH/C12:1-DC <sup>\$</sup>	0.0108 ± 0.0009	0.0086 ± 0.0006	0.0125 ± 0.0018	0.0099 ± 0.0010
	C14-OH/C12-DC <sup>\$</sup>	0.0039 ± 0.0006	0.0034 ± 0.0004	0.0037 ± 0.0004	0.0034 ± 0.0005
Long ACC	C16:3 <sup>\$</sup>	0.0024 ± 0.0005	0.0020 ± 0.0002	0.0026 ± 0.0005	0.0018 ± 0.0002
	C16:2 <sup>\$</sup>	0.0084 ± 0.0014	0.0073 ± 0.0012	0.0077 ± 0.0007	0.0059 ± 0.0011
	C16 <sup>\$</sup>	0.1056 ± 0.0196	0.0844 ± 0.0092	0.1110 ± 0.0156	0.0571 ± 0.0080
	C16:3-OH/C14:3-DC <sup>\$</sup>	0.0017 ± 0.0004	0.0018 ± 0.0004	0.0021 ± 0.0003	0.0017 ± 0.0003
	C16:1-OH/C14:1-DC <sup>\$</sup>	0.0089 ± 0.0013	0.0078 ± 0.0008	0.0110 ± 0.0013	0.0091 ± 0.0012
	C16-OH/C14-DC <sup>\$</sup>	0.0068 ± 0.0007	0.0064 ± 0.0004	0.0071 ± 0.0007	0.0066 ± 0.0010
	C18:3 <sup>\$</sup>	0.0057 ± 0.0011	0.0061 ± 0.0006	0.0060 ± 0.0009	0.0051 ± 0.0012
	C18:2 <sup>\$</sup>	0.0574 ± 0.0154	0.0414 ± 0.0084	0.0473 ± 0.0058	0.0300 ± 0.0063
	C18:1 <sup>\$</sup>	0.2602 ± 0.0530	0.1464 ± 0.0253	0.2547 ± 0.0457	0.1026 ± 0.0207
	C18 <sup>\$</sup>	0.0454 ± 0.0071	0.0370 ± 0.0038	0.0476 ± 0.0087	0.0281 ± 0.0034
	C18:3-OH/C16:3-DC <sup>\$</sup>	0.0019 ± 0.0005	0.0021 ± 0.0003	0.0021 ± 0.0002	0.0037 ± 0.0008
	C18:2-OH/C16:2-DC <sup>\$</sup>	0.0036 ± 0.0013	0.0040 ± 0.0005	0.0036 ± 0.0003	0.0046 ± 0.0007
	C18:1-OH/C16:1-DC <sup>\$</sup>	0.0113 ± 0.0022	0.0098 ± 0.0013	0.0111 ± 0.0017	0.0095 ± 0.0017
	C18-OH/C16-DC <sup>\$</sup>	0.0058 ± 0.0009	0.0067 ± 0.0006	0.0073 ± 0.0009	0.0070 ± 0.0005
	C20:4 <sup>\$</sup>	0.0089 ± 0.0010	0.0076 ± 0.0011	0.0073 ± 0.0012	0.0071 ± 0.0008
	C20:3 <sup>\$</sup>	0.0052 ± 0.0006	0.0048 ± 0.0006	0.0053 ± 0.0005	0.0045 ± 0.0008

	C20:2 <sup>\$</sup>	0.0113 ± 0.0029	0.0084 ± 0.0016	0.0099 ± 0.0025	0.0069 ± 0.0014
	C20:1 <sup>\$</sup>	0.0256 ± 0.0045	0.0182 ± 0.0033	0.0266 ± 0.0051	0.0121 ± 0.0026
	C20 <sup>\$</sup>	0.0074 ± 0.0011	0.0095 ± 0.0016	0.0075 ± 0.0007	0.0086 ± 0.0010
	C20:3-OH/C18:3-DC <sup>\$</sup>	0.0016 ± 0.0003	0.0018 ± 0.0004	0.0020 ± 0.0004	0.0024 ± 0.0003
	C20:2-OH/C18:2-DC <sup>\$</sup>	0.0023 ± 0.0007	0.0036 ± 0.0006	0.0022 ± 0.0004	0.0032 ± 0.0005
	C20:1-OH/C18:1-DC <sup>\$</sup>	0.0036 ± 0.0005	0.0035 ± 0.0005	0.0044 ± 0.0004	0.0042 ± 0.0004
	C20-OH/C18- DC/C22:6 <sup>\$</sup>	0.0028 ± 0.0003	0.0024 ± 0.0004	0.0031 ± 0.0004	0.0029 ± 0.0007
	C22:5 <sup>\$</sup>	0.0019 ± 0.0004	0.0022 ± 0.0004	0.0027 ± 0.0003	0.0024 ± 0.0007
	C22:4 <sup>\$</sup>	0.0020 ± 0.0002	0.0016 ± 0.0003	0.0016 ± 0.0003	0.0016 ± 0.0002
	C22:2 <sup>\$</sup>	0.0016 ± 0.0002	0.0019 ± 0.0003	0.0022 ± 0.0002	0.0022 ± 0.0003
	C22:1 <sup>\$</sup>	0.0038 ± 0.0009	0.0054 ± 0.0011	0.0037 ± 0.0005	0.0075 ± 0.0014
	C22 <sup>\$</sup>	0.0021 ± 0.0005	0.0023 ± 0.0003	0.0016 ± 0.0003	0.0023 ± 0.0006

<sup>\$</sup> Metabolite concentrations are expressed as  $\mu\text{M}$ . <sup>#</sup> Metabolite concentrations are expressed as pmol/mg. Data are presented as means  $\pm$  SEM.

**Supplementary Table 4. Summary of non-significant exercise effects in muscle metabolites.**

Metabolite class	Metabolites	SED	MATEX	PATEX	PAREX
Amino acids	Glycine <sup>s</sup>	56.17 ± 3.08	61.34 ± 3.71	59.03 ± 3.46	56.19 ± 5.24
	Alanine <sup>s</sup>	86.31 ± 6.16	94.40 ± 7.67	95.55 ± 2.51	101.91 ± 3.92
	Proline <sup>s</sup>	6.30 ± 0.35	6.57 ± 0.47	6.49 ± 0.32	6.47 ± 0.23
	Valine <sup>s</sup>	9.80 ± 0.51	10.01 ± 0.85	9.10 ± 0.25	10.02 ± 0.35
	Leucine/Isoleucine <sup>s</sup>	17.23 ± 0.92	17.79 ± 1.35	17.68 ± 0.62	17.33 ± 0.93
	Methionine <sup>s</sup>	4.26 ± 0.36	4.19 ± 0.34	4.18 ± 0.21	4.41 ± 0.21
	Histidine <sup>s</sup>	6.53 ± 0.26	7.76 ± 0.50	7.33 ± 0.36	6.71 ± 0.26
	Phenylalanine <sup>s</sup>	3.53 ± 0.29	3.60 ± 0.40	3.57 ± 0.20	3.33 ± 0.17
	Tyrosine <sup>s</sup>	4.68 ± 0.43	5.40 ± 0.47	4.36 ± 0.32	4.30 ± 0.22
	Aspartate/Asparagine <sup>s</sup>	8.67 ± 1.21	10.04 ± 1.00	6.71 ± 0.62	10.01 ± 0.68
	Glutamate/Glutamine <sup>s</sup>	43.16 ± 4.13	42.34 ± 1.67	35.74 ± 1.82	41.18 ± 1.79
	Ornithine <sup>s</sup>	2.19 ± 0.13	2.62 ± 0.36	1.95 ± 0.09	2.33 ± 0.20
	Citrulline <sup>s</sup>	3.50 ± 0.24	3.84 ± 0.32	3.51 ± 0.23	3.73 ± 0.15
Organic acids	Pyruvate <sup>s</sup>	2.84 ± 0.46	2.88 ± 0.54	2.87 ± 0.43	1.98 ± 0.27
	Fumarate <sup>s</sup>	1.20 ± 0.06	1.03 ± 0.08	1.08 ± 0.08	1.06 ± 0.06
	α-Ketoglutarate <sup>s</sup>	0.13 ± 0.02	0.17 ± 0.03	0.13 ± 0.02	0.09 ± 0.01
Nucleotides	GDP-mannose <sup>#</sup>	2.55 ± 0.18	3.06 ± 0.23	2.81 ± 0.21	2.77 ± 0.05
	GMP <sup>#</sup>	7.39 ± 1.40	9.01 ± 2.52	4.65 ± 0.26	4.82 ± 0.40
	NADH <sup>#</sup>	5.32 ± 1.10	5.59 ± 1.54	6.75 ± 1.36	12.04 ± 2.68
Short ACC	C2 <sup>s</sup>	3.21 ± 0.19	3.23 ± 0.23	3.65 ± 0.25	3.68 ± 0.14
	C3 <sup>s</sup>	0.0399 ± 0.0043	0.0365 ± 0.0041	0.0372 ± 0.0031	0.0425 ± 0.0029
	C4/Ci4 <sup>s</sup>	0.1523 ± 0.0141	0.1465 ± 0.0251	0.1533 ± 0.0151	0.1784 ± 0.0131
	C5 <sup>s</sup>	0.0488 ± 0.0093	0.0372 ± 0.0042	0.0420 ± 0.0031	0.0439 ± 0.0037
	C4-OH <sup>s</sup>	0.0804 ± 0.0092	0.0737 ± 0.0069	0.1099 ± 0.0281	0.0842 ± 0.0088
	C6 <sup>s</sup>	0.0300 ± 0.0021	0.0236 ± 0.0024	0.0248 ± 0.0025	0.0259 ± 0.0023
	C5-OH/C3-DC <sup>s</sup>	0.0500 ± 0.0042	0.0500 ± 0.0034	0.0472 ± 0.0030	0.0572 ± 0.0015
	C4-DC/Ci4-DC <sup>s</sup>	0.0469 ± 0.0066	0.0380 ± 0.0035	0.0379 ± 0.0033	0.0478 ± 0.0022
	C8:1 <sup>s</sup>	0.0022 ± 0.0006	0.0024 ± 0.0004	0.0020 ± 0.0003	0.0027 ± 0.0003
	C5-DC <sup>s</sup>	0.0034 ± 0.0010	0.0024 ± 0.0003	0.0021 ± 0.0004	0.0041 ± 0.0007
	C8:1-OH/C6:1-DC <sup>s</sup>	0.0025 ± 0.0005	0.0021 ± 0.0002	0.0019 ± 0.0003	0.0029 ± 0.0003
	C6-DC/C8-OH <sup>s</sup>	0.0047 ± 0.0006	0.0041 ± 0.0004	0.0042 ± 0.0004	0.0050 ± 0.0005
	C10:3 <sup>s</sup>	0.0008 ± 0.0003	0.0005 ± 0.0002	0.0004 ± 0.0002	0.0004 ± 0.0003
	C10:2 <sup>s</sup>	0.0008 ± 0.0004	0.0009 ± 0.0003	0.0003 ± 0.0002	0.0008 ± 0.0003
	C7-DC <sup>s</sup>	0.0015 ± 0.0006	0.0016 ± 0.0003	0.0009 ± 0.0003	0.0028 ± 0.0009
	C8:1-DC <sup>s</sup>	0.0023 ± 0.0006	0.0016 ± 0.0002	0.0011 ± 0.0002	0.0024 ± 0.0005

	C12:2 <sup>\$</sup>	0.0011 ± 0.0005	0.0005 ± 0.0002	0.0010 ± 0.0003	0.0013 ± 0.0002
	C12 <sup>\$</sup>	0.0307 ± 0.0030	0.0237 ± 0.0031	0.0261 ± 0.0023	0.0278 ± 0.0041
	C12:2-OH/C10:2-DC <sup>\$</sup>	0.0019 ± 0.0003	0.0017 ± 0.0003	0.0013 ± 0.0003	0.0017 ± 0.0004
	C12:1-OH/C10:1-DC <sup>\$</sup>	0.0039 ± 0.0005	0.0026 ± 0.0002	0.0033 ± 0.0001	0.0034 ± 0.0004
	C12-OH/C10-DC <sup>\$</sup>	0.0045 ± 0.0006	0.0039 ± 0.0007	0.0040 ± 0.0004	0.0027 ± 0.0004
	C14:3 <sup>\$</sup>	0.0018 ± 0.0003	0.0014 ± 0.0002	0.0019 ± 0.0004	0.0017 ± 0.0002
	C14:2 <sup>\$</sup>	0.0161 ± 0.0018	0.0153 ± 0.0026	0.0132 ± 0.0014	0.0139 ± 0.0013
	C14 <sup>\$</sup>	0.1047 ± 0.0133	0.0839 ± 0.0153	0.0936 ± 0.0091	0.0803 ± 0.0126
	C14:3-OH/C12:3-DC <sup>\$</sup>	0.0007 ± 0.0003	0.0005 ± 0.0002	0.0002 ± 0.0001	0.0006 ± 0.0003
	C14-OH/C12-DC <sup>\$</sup>	0.0068 ± 0.0006	0.0056 ± 0.0005	0.0062 ± 0.0004	0.0064 ± 0.0006
Long ACC	C16:3 <sup>\$</sup>	0.0054 ± 0.0007	0.0048 ± 0.0009	0.0038 ± 0.0004	0.0038 ± 0.0004
	C16:2 <sup>\$</sup>	0.0531 ± 0.0058	0.0467 ± 0.0086	0.0455 ± 0.0047	0.0435 ± 0.0059
	C16:1 <sup>\$</sup>	0.1507 ± 0.0168	0.1155 ± 0.0258	0.1394 ± 0.0127	0.1094 ± 0.0165
	C16 <sup>\$</sup>	0.3628 ± 0.0502	0.2881 ± 0.0742	0.3263 ± 0.0419	0.2666 ± 0.0527
	C16:3-OH/C14:3-DC <sup>\$</sup>	0.0011 ± 0.0003	0.0009 ± 0.0002	0.0005 ± 0.0002	0.0007 ± 0.0003
	C16:2-OH/C14:2-DC <sup>\$</sup>	0.0075 ± 0.0006	0.0062 ± 0.0014	0.0067 ± 0.0005	0.0067 ± 0.0008
	C16:1-OH/C14:1-DC <sup>\$</sup>	0.0169 ± 0.0012	0.0126 ± 0.0024	0.0164 ± 0.0017	0.0129 ± 0.0012
	C16-OH/C14-DC <sup>\$</sup>	0.0168 ± 0.0013	0.0123 ± 0.0022	0.0176 ± 0.0024	0.0116 ± 0.0016
	C18:3 <sup>\$</sup>	0.0166 ± 0.0015	0.0135 ± 0.0026	0.0175 ± 0.0020	0.0135 ± 0.0019
	C18:2 <sup>\$</sup>	0.2466 ± 0.0301	0.2134 ± 0.0576	0.2255 ± 0.0283	0.1773 ± 0.0320
	C18:1 <sup>\$</sup>	0.5348 ± 0.0691	0.4220 ± 0.1189	0.5134 ± 0.0666	0.3712 ± 0.0700
	C18 <sup>\$</sup>	0.1452 ± 0.0201	0.1160 ± 0.0250	0.1320 ± 0.0165	0.1144 ± 0.0194
	C18:3-OH/C16:3-DC <sup>\$</sup>	0.0019 ± 0.0003	0.0014 ± 0.0003	0.0016 ± 0.0004	0.0020 ± 0.0004
	C18:2-OH/C16:2-DC <sup>\$</sup>	0.0157 ± 0.0009	0.0152 ± 0.0024	0.0176 ± 0.0023	0.0135 ± 0.0017
	C18:1-OH/C16:1-DC <sup>\$</sup>	0.0285 ± 0.0022	0.0236 ± 0.0043	0.0328 ± 0.0042	0.0225 ± 0.0022
	C18-OH/C16-DC <sup>\$</sup>	0.0112 ± 0.0011	0.0078 ± 0.0011	0.0112 ± 0.0014	0.0104 ± 0.0014
	C20:3 <sup>\$</sup>	0.0143 ± 0.0018	0.0113 ± 0.0022	0.0121 ± 0.0018	0.0103 ± 0.0017

	C20:2 <sup>\$</sup>	0.0444 ± 0.0070	0.0348 ± 0.0085	0.0478 ± 0.0106	0.0365 ± 0.0059
	C20:1 <sup>\$</sup>	0.0667 ± 0.0088	0.0466 ± 0.0104	0.0704 ± 0.0153	0.0525 ± 0.0089
	C20 <sup>\$</sup>	0.0107 ± 0.0014	0.0098 ± 0.0023	0.0104 ± 0.0022	0.0096 ± 0.0017
	C20:3-OH/C18:3-DC <sup>\$</sup>	0.0021 ± 0.0004	0.0011 ± 0.0003	0.0014 ± 0.0003	0.0017 ± 0.0003
	C20:2-OH/C18:2-DC <sup>\$</sup>	0.0059 ± 0.0008	0.0047 ± 0.0006	0.0062 ± 0.0014	0.0057 ± 0.0005
	C20:1-OH/C18:1-DC <sup>\$</sup>	0.0081 ± 0.0009	0.0057 ± 0.0008	0.0082 ± 0.0014	0.0070 ± 0.0008
	C20-OH/C18- DC/C22:6 <sup>\$</sup>	0.0217 ± 0.0043	0.0151 ± 0.0063	0.0108 ± 0.0025	0.0107 ± 0.0024
	C22:5 <sup>\$</sup>	0.0207 ± 0.0034	0.0144 ± 0.0039	0.0130 ± 0.0023	0.0151 ± 0.0035
	C22:2 <sup>\$</sup>	0.0036 ± 0.0008	0.0033 ± 0.0007	0.0047 ± 0.0014	0.0038 ± 0.0004
	C22:1 <sup>\$</sup>	0.0057 ± 0.0009	0.0051 ± 0.0007	0.0073 ± 0.0015	0.0071 ± 0.0010
	C22 <sup>\$</sup>	0.0014 ± 0.0003	0.0012 ± 0.0001	0.0012 ± 0.0005	0.0017 ± 0.0002

<sup>\$</sup> Metabolite concentrations are expressed as  $\mu\text{M}$ . <sup>#</sup> Metabolite concentrations are expressed as pmol/mg. Data are presented as means  $\pm$  SEM.

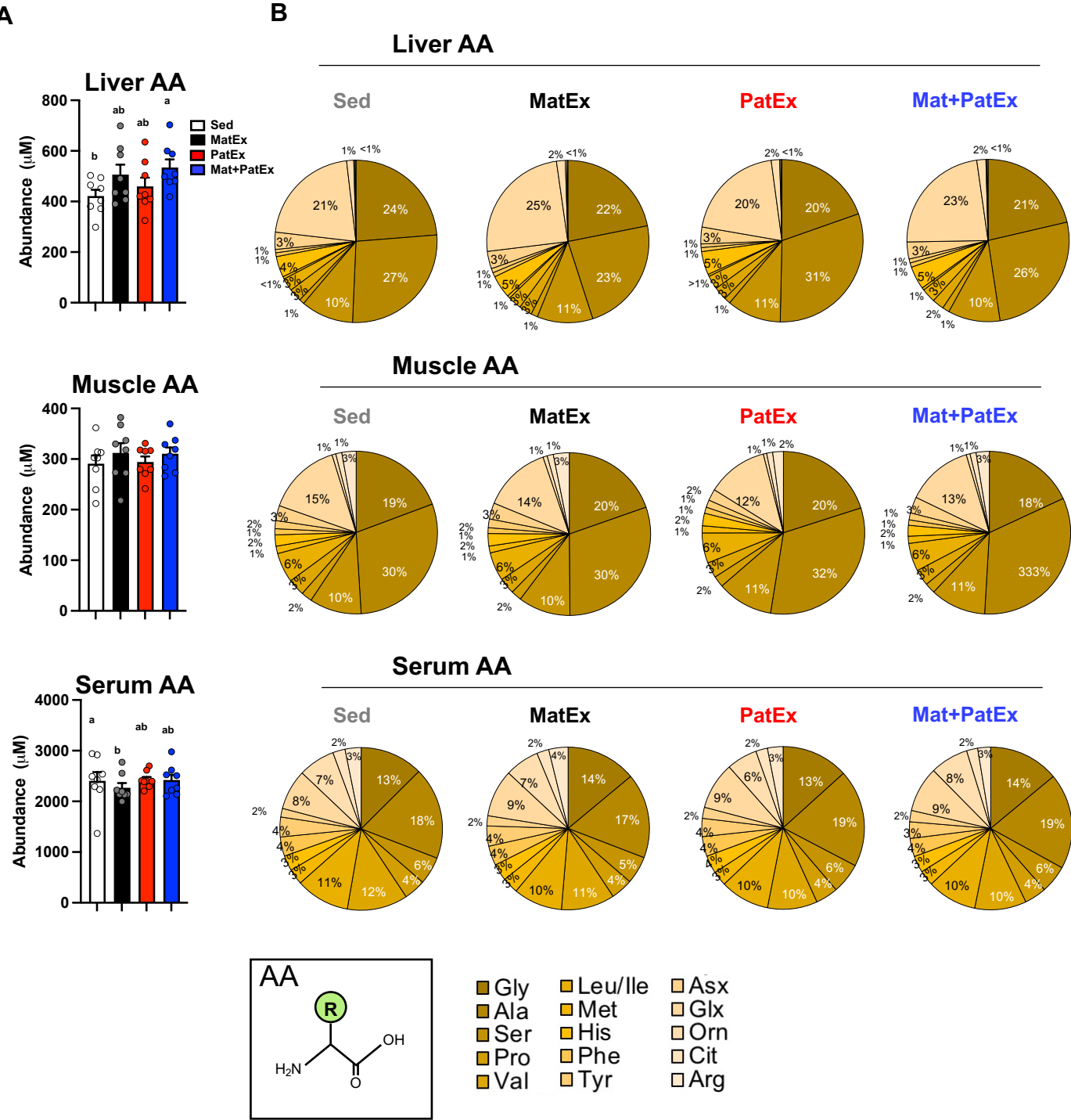
**Supplementary Table 5. Summary of non-significant exercise effects in serum metabolites.**

Metabolite class	Metabolite	SED	MATEX	PATEX	PAREX
Amino acids	Glycine <sup>\$</sup>	301.24 ± 14.40	316.85 ± 10.05	322.97 ± 12.02	338.28 ± 11.41
	Alanine <sup>\$</sup>	439.85 ± 39.22	382.91 ± 23.52	469.79 ± 22.25	460.76 ± 23.65
	Serine <sup>\$</sup>	132.45 ± 9.58	124.58 ± 9.55	147.09 ± 6.32	133.57 ± 3.17
	Proline	103.68 ± 10.99	99.10 ± 6.93	108.10 ± 4.27	105.80 ± 6.55
	Leucine/Isoleucine <sup>\$</sup>	257.24 ± 23.35	220.91 ± 12.27	237.55 ± 7.85	239.13 ± 12.21
	Methionine <sup>\$</sup>	74.35 ± 8.51	72.43 ± 8.92	70.73 ± 2.10	73.66 ± 4.76
	Phenylalanine <sup>\$</sup>	91.81 ± 7.21	88.17 ± 4.01	95.48 ± 2.59	87.63 ± 4.23
	Tyrosine <sup>\$</sup>	94.63 ± 8.42	90.97 ± 3.57	87.70 ± 4.55	79.72 ± 2.52
	Ornithine <sup>\$</sup>	174.92 ± 15.31	154.83 ± 12.34	147.85 ± 12.58	184.14 ± 18.98
	Citrulline <sup>\$</sup>	58.96 ± 4.50	54.58 ± 1.91	56.54 ± 1.74	53.59 ± 2.50
	Arginine <sup>\$</sup>	76.59 ± 8.39	87.11 ± 17.15	75.07 ± 15.33	62.27 ± 11.53
Short ACC	C2 <sup>\$</sup>	26.85 ± 1.20	25.85 ± 0.64	27.40 ± 1.39	27.56 ± 0.88
	C4/Ci4 <sup>\$</sup>	2.60 ± 0.49	3.09 ± 0.38	2.80 ± 0.48	2.36 ± 0.41
	C5:1 <sup>\$</sup>	0.1252 ± 0.0119	0.1087 ± 0.0046	0.1274 ± 0.0100	0.1084 ± 0.0071
	C5 <sup>\$</sup>	0.2036 ± 0.0238	0.2549 ± 0.0229	0.2569 ± 0.0143	0.2285 ± 0.0245
	C6 <sup>\$</sup>	0.1199 ± 0.0289	0.1631 ± 0.0382	0.1089 ± 0.0139	0.1504 ± 0.0245
	C5-OH/C3-DC <sup>\$</sup>	0.1280 ± 0.0061	0.1372 ± 0.0082	0.1450 ± 0.0101	0.1590 ± 0.0111
	C8:1 <sup>\$</sup>	0.0093 ± 0.0005	0.0071 ± 0.0009	0.0079 ± 0.0008	0.0100 ± 0.0010
	C8 <sup>\$</sup>	0.0223 ± 0.0018	0.0214 ± 0.0013	0.0207 ± 0.0017	0.0274 ± 0.0022
	C5-DC <sup>\$</sup>	0.0225 ± 0.0032	0.0231 ± 0.0028	0.0223 ± 0.0023	0.0324 ± 0.0048
	C6-DC/C8-OH <sup>\$</sup>	0.0309 ± 0.0030	0.0304 ± 0.0028	0.0282 ± 0.0024	0.0357 ± 0.0032
	C10:3 <sup>\$</sup>	0.0044 ± 0.0008	0.0033 ± 0.0008	0.0039 ± 0.0006	0.0030 ± 0.0007
	C10:2 <sup>\$</sup>	0.0042 ± 0.0008	0.0045 ± 0.0003	0.0056 ± 0.0010	0.0050 ± 0.0004
	C10:1 <sup>\$</sup>	0.0117 ± 0.0017	0.0133 ± 0.0014	0.0163 ± 0.0014	0.0137 ± 0.0014
	C10 <sup>\$</sup>	0.0254 ± 0.0013	0.0216 ± 0.0020	0.0237 ± 0.0018	0.0222 ± 0.0020
	C7-DC <sup>\$</sup>	0.0128 ± 0.0007	0.0134 ± 0.0013	0.0122 ± 0.0005	0.0157 ± 0.0023
	C8:1-DC <sup>\$</sup>	0.0067 ± 0.0004	0.0058 ± 0.0005	0.0061 ± 0.0002	0.0067 ± 0.0011
	C10-OH/C8-DC <sup>\$</sup>	0.0178 ± 0.0013	0.0158 ± 0.0013	0.0184 ± 0.0012	0.0167 ± 0.0014
	C12:1 <sup>\$</sup>	0.0136 ± 0.0019	0.0124 ± 0.0015	0.0147 ± 0.0012	0.0140 ± 0.0011
	C12 <sup>\$</sup>	0.0239 ± 0.0014	0.0208 ± 0.0016	0.0246 ± 0.0008	0.0218 ± 0.0017
	C12-OH/C10-DC <sup>\$</sup>	0.0096 ± 0.0008	0.0080 ± 0.0009	0.0088 ± 0.0007	0.0067 ± 0.0011
	C14:2 <sup>\$</sup>	0.0187 ± 0.0011	0.0153 ± 0.0015	0.0193 ± 0.0016	0.0191 ± 0.0025
	C14 <sup>\$</sup>	0.0644 ± 0.0049	0.0544 ± 0.0038	0.0575 ± 0.0023	0.0556 ± 0.0038
	C14:1-OH <sup>\$</sup>	0.0174 ± 0.0011	0.0144 ± 0.0015	0.0200 ± 0.0010	0.0168 ± 0.0017
	C14-OH/C12-DC <sup>\$</sup>	0.0092 ± 0.0006	0.0084 ± 0.0008	0.0082 ± 0.0005	0.0079 ± 0.0009
Long ACC	C16:2 <sup>\$</sup>	0.0143 ± 0.0009	0.0143 ± 0.0015	0.0153 ± 0.0010	0.0146 ± 0.0016
	C16:1 <sup>\$</sup>	0.0710 ± 0.0081	0.0556 ± 0.0056	0.0656 ± 0.0052	0.0575 ± 0.0061
	C16-OH/C14-DC <sup>\$</sup>	0.0124 ± 0.0013	0.0109 ± 0.0011	0.0126 ± 0.0014	0.0113 ± 0.0012
	C18:2 <sup>\$</sup>	0.0765 ± 0.0050	0.0711 ± 0.0066	0.0672 ± 0.0034	0.0723 ± 0.0053
	C18:2-OH <sup>\$</sup>	0.0090 ± 0.0009	0.0067 ± 0.0004	0.0086 ± 0.0008	0.0086 ± 0.0011
	C18-OH/C16-DC <sup>\$</sup>	0.0187 ± 0.0014	0.0140 ± 0.0022	0.0198 ± 0.0020	0.0178 ± 0.0014
	C20 <sup>\$</sup>	0.0057 ± 0.0005	0.0035 ± 0.0008	0.0043 ± 0.0005	0.0046 ± 0.0009
	C18:1-DC <sup>\$</sup>	0.0102 ± 0.0014	0.0084 ± 0.0011	0.0105 ± 0.0010	0.0118 ± 0.0013
	C20-OH/C18-DC <sup>\$</sup>	0.0053 ± 0.0003	0.0051 ± 0.0007	0.0051 ± 0.0006	0.0045 ± 0.0004
	C22 <sup>\$</sup>	0.0019 ± 0.0006	0.0028 ± 0.0005	0.0024 ± 0.0004	0.0023 ± 0.0004

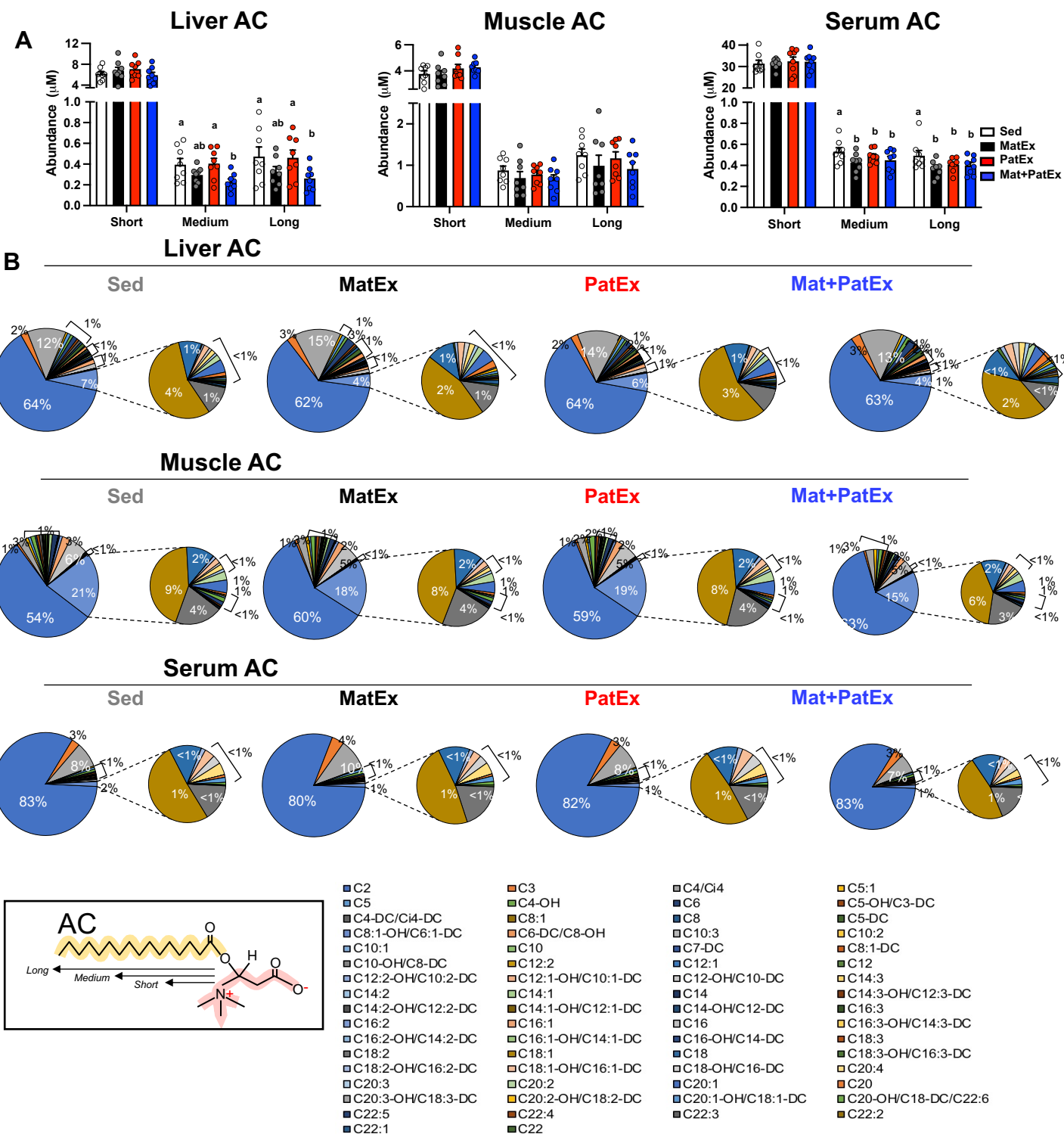
<sup>\$</sup> Metabolite concentrations are expressed as  $\mu\text{M}$ . <sup>#</sup> Metabolite concentrations are expressed as pmol/mg. Data are presented as means ± SEM.



Suppl. Fig 1.



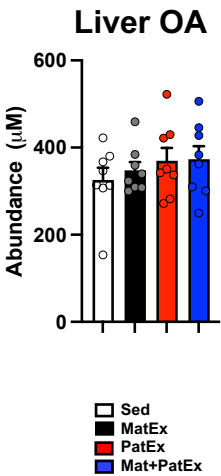
**Suppl. Fig. 1. Amino acid profiles in male offspring.** (A) Amino acid abundance in liver, muscle and serum in male offspring from Sed, MatEx, PatEx, and Mat+PatEx. Abundance is shown as the sum of  $\mu\text{M}$  concentration of AA by tissue. (B) Amino acid composition according to relative concentration in liver, muscle and serum. Amino acid color keys are show at the bottom of the figure. (\*  $p < 0.05$  vs. Sed offspring;  $n = 8/\text{group}$ ).



**Suppl. Fig. 2. Acylcarnitine profiles in male offspring.** (A) Short (C2-C10), medium (C12-C16), and long Acylcarnitine (C18-C22) abundance in liver, muscle and serum in male offspring from Sed, MatEx, PatEx, and Mat+PatEx. Abundance is shown as the sum of  $\mu\text{M}$  concentration of acylcarnitines by tissue. (B) Acylcarnitine composition according to relative concentration in liver, muscle and serum for short, medium and long AC. Acylcarnitine color keys are show at the bottom of the figure. (\* $p < 0.05$  vs. Sed offspring;  $n = 8/\text{group}$ ).

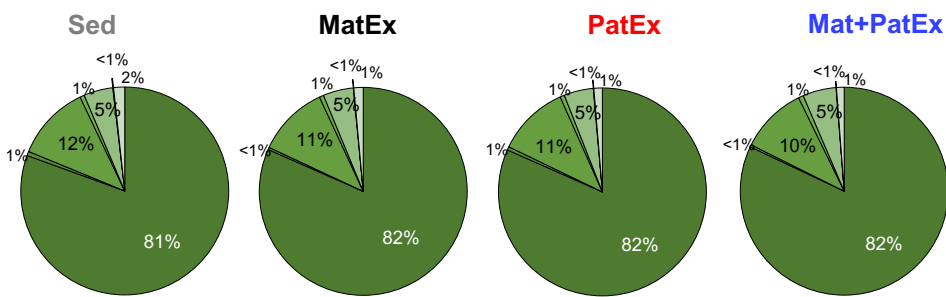
Suppl. Fig 3.

A

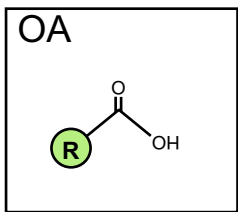
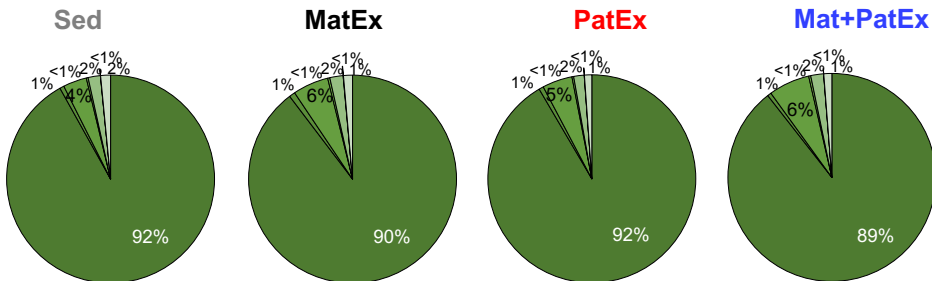
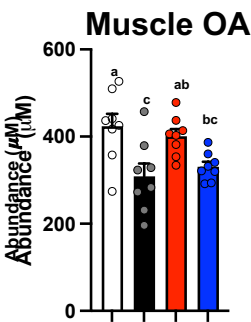


B

Liver OA



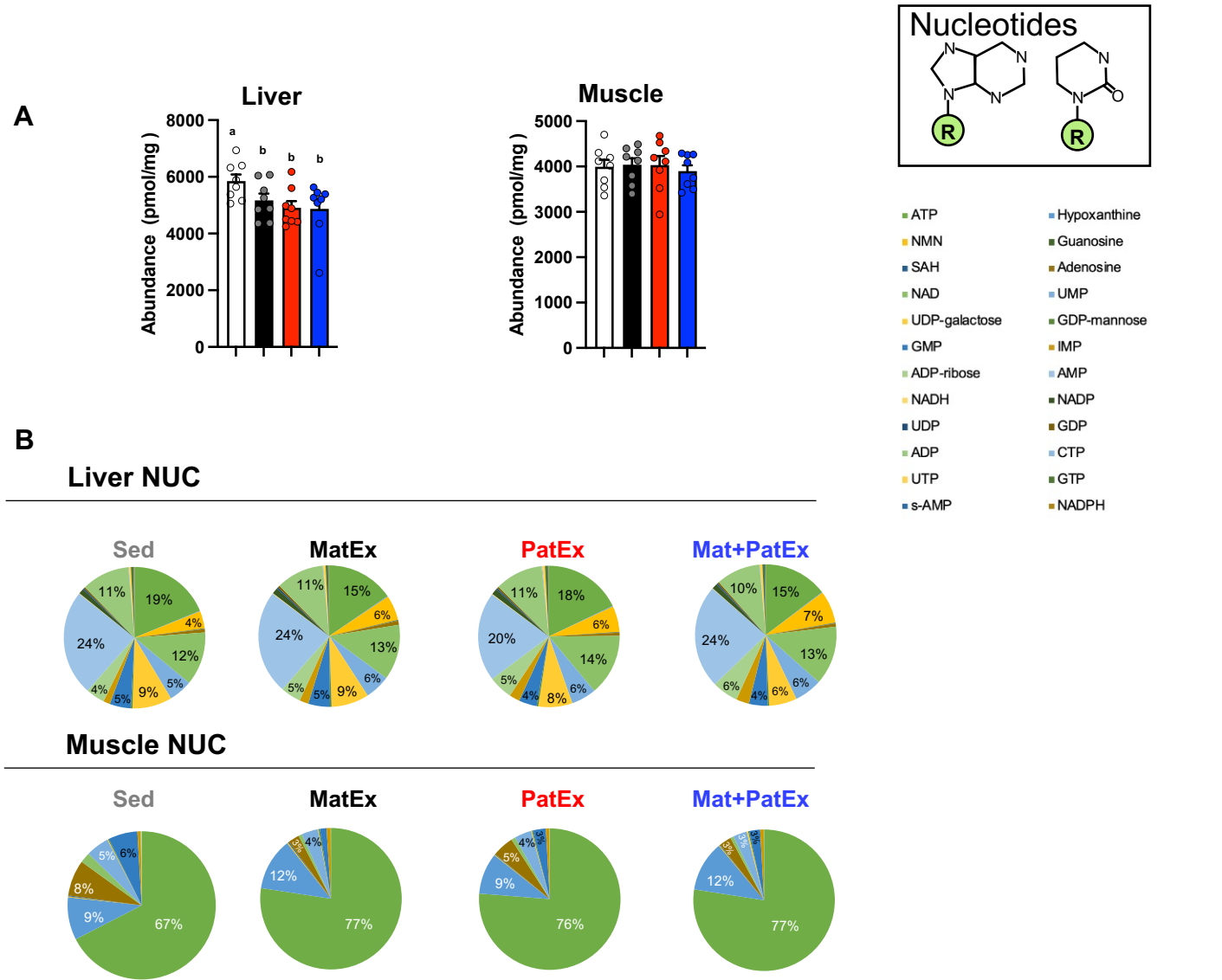
Muscle OA



- Lactate
- Pyruvate
- Succinate
- Fumarate
- Malate
- a-Kg
- Citrate

**Suppl. Fig. 3. Organic acid profiles in male offspring.** (A) Organic acid abundance in liver and muscle in male offspring offspring from Sed, MatEx, PatEx, and Mat+PatEx. Abundance is shown as the sum of μM concentration of organic acids. (B) Organic acid composition according to relative concentration in liver and muscle. Organic acid color keys are show on the right side of the figure. (\*p<0.05 vs. Sed offspring; n=8/group).

Suppl. Fig 4.



**Suppl. Fig. 4. Nucleotide profiles in male offspring.** (A) Nucleotide abundance in liver and muscle in male offspring from Sed, MatEx, PatEx, and Mat+PatEx. Abundance is shown as the sum of pmol/mg concentration of nucleotides by tissue. (B) Nucleotide composition according to relative concentration in liver and muscle. Nucleotide color keys are show on the right side of the figure. (\*p<0.05 vs. Sed offspring; n=8/group).