Article

A Transcriptomic Response to *Lactiplantibacillus plantarum*-KCC48 against High-Fat Diet-Induced Fatty Liver Diseases in Mice

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Table S1. Differentially expressed genes in the livers of HFD-fed animals compared with controls

S. No	Gene Symbol	Gene Name	Fold Changes	*P* value
1	1810008I18Rik	RIKEN cDNA 1810008I18 gene(1810008I18Rik)	0.445	0.00005
2	9030619P08Rik	lymphocyte antigen 6 complex pseudogene(9030619P08Rik)	2.094	0.00005
3	Abcc3	ATP-binding cassette, sub-family C (CFTR/MRP), member 3(Abcc3)	3.739	0.00005
4	Acaa1b	acetyl-Coenzyme A acyltransferase 1B(Acaa1b)	2.846	0.00005
5	Acadm	acyl-Coenzyme A dehydrogenase, medium chain(Acadm)	2.081	0.00005
6	Acly	ATP citrate lyase(Acly)	0.349	0.00005
7	Acmsd	amino carboxymuconate semialdehyde decarboxylase(Acmsd)	0.442	0.00005
8	Acnat2	acyl-coenzyme A amino acid N-acyltransferase 2(Acnat2)	2.775	0.00005
9	Acot1	acyl-CoA thioesterase 1(Acot1)	5.142	0.00005
10	Acss2	acyl-CoA synthetase short-chain family member 2(Acss2)	0.484	0.00005
11	Acss3	acyl-CoA synthetase short-chain family member 3(Acss3)	4.278	0.00005
12	Adam11	a disintegrin and metallopeptidase domain 11(Adam11)	2.318	0.00005
13	Adhfe1	alcohol dehydrogenase, iron containing, 1(Adhfe1)	2.557	0.00005
14	Aldh1a1	aldehyde dehydrogenase family 1, subfamily A1(Aldh1a1)	2.539	0.00005
15	Aldh3a2	aldehyde dehydrogenase family 3, subfamily A2(Aldh3a2)	6.414	0.00005
16	Ang	angiogenin, ribonuclease, RNase A family, 5(Ang)	0.498	0.04865
17	Angptl4	angiopoietin-like 4(Angptl4)	2.147	0.00005
18	Anxa2	annexin A2(Anxa2)	2.888	0.00005
19	Apol9a	apolipoprotein L 9a(Apol9a)	2.532	0.00005
20	Apol9b	apolipoprotein L 9b(Apol9b)	2.080	0.00005
21	Apom	apolipoprotein M(Apom)	0.465	0.00005
22	Arntl	aryl hydrocarbon receptor nuclear translocator-like(Arntl)	0.477	0.00005
23	Arrdc3	arrestin domain containing 3(Arrdc3)	2.038	0.00005
24	Avpr1a	arginine vasopressin receptor 1A(Avpr1a)	0.454	0.00005
25	Bche	butyrylcholinesterase(Bche)	2.055	0.00005
26	Cd36	CD36 antigen(Cd36)	3.558	0.00005
27	Cd74	CD74 antigen (invariant polypeptide of major histocompatibility complex, class II antigen-associated)(Cd74)	2.053	0.00005
28	Cdh1	cadherin 1(Cdh1)	0.242	0.00005
29	Ces1g	carboxylesterase 1G(Ces1g)	2.228	0.00005
30	Ces2a	carboxylesterase 2A(Ces2a)	0.290	0.00005
31	Chka	choline kinase alpha(Chka)	0.400	0.00005
32	Cry1	cryptochrome 1 (photolyase-like)(Cry1)	0.438	0.00005
33	Ctse	cathepsin E(Ctse)	3.918	0.00005
34	Cyp2a12	cytochrome P450, family 2, subfamily a, polypeptide 12(Cyp2a12)	0.427	0.00005
35	Cyp2b9	cytochrome P450, family 2, subfamily b, polypeptide 9(Cyp2b9)	13.813	0.00005
36	Cyp2c37	cytochrome P450, family 2. subfamily c, polypeptide 37(Cyp2c37)	3.299	0.00005
37	Cyp2c38	cytochrome P450, family 2, subfamily c, polypeptide 38(Cyp2c38)	6.591	0.00005
38	Cyp2c39	cytochrome P450, family 2, subfamily c, polypeptide 39(Cyp2c39)	9.718	0.00005
39	Cyp2c44	cytochrome P450, family 2, subfamily c, polypeptide 44(Cyp2c44)	2.282	0.00005
40	Cyp2c50	cytochrome P450, family 2, subfamily c, polypeptide 50(Cyp2c50)	2.790	0.00005
41	Cyp2c54	cytochrome P450, family 2, subfamily c, polypeptide 54(Cyp2c54)	3.351	0.00005
42	Cyp3a11	cytochrome P450, family 3, subfamily a, polypeptide 11(Cyp3a11)	5.499	0.00005
43	Cyp3a59	cytochrome P450, family 3, subfamily a, polypeptide 59(Cyp3a59)	4.626	0.00005
44	Cyp46a1	cytochrome P450, family 46, subfamily a, polypeptide 1(Cyp46a1)	2.026	0.00005
45	Cyp4a10	cytochrome P450, family 4, subfamily a, polypeptide 10(Cyp4a10)	26.691	0.00005
46	Cyp4a12b	cytochrome P450, family 4, subfamily a, polypeptide 12B(Cyp4a12b)	2.282	0.00005
47	Cyp4a14	cytochrome P450, family 4, subfamily a, polypeptide 14(Cyp4a14)	24.394	0.0001
48	Cyp51	cytochrome P450, family 51(Cyp51)	0.454	0.00005
49	Cyp7a1	cytochrome P450, family 7, subfamily a, polypeptide 1(Cyp7a1)	4.482	0.00005
50	Dbp	D site albumin promoter binding protein(Dbp)	13.345	0.0429

51	Ddah1	dimethylarginine dimethylaminohydrolase 1(Ddah1)	2.251	0.00005
52	Derl3	Der1-like domain family, member 3(Derl3)	3.311	0.00005
53	Dhcr7	7-dehydrocholesterol reductase(Dhcr7)	0.454	0.00005
54	Dio1	deiodinase, iodothyronine, type I(Dio1)	3.168	0.00005
55	Dmbt1	deleted in malignant brain tumors 1(Dmbt1)	47.186	0.00005
56	Ehhadh	enoyl-Coenzyme A, hydratase/3-hydroxyacyl Coenzyme A dehydrogenase(Ehhadh)	2.223	0.00005
57	Elovl3	elongation of very long chain fatty acids (FEN1/Elo2, SUR4/Elo3, yeast)-like 3(Elovl3)	0.271	0.00005
58	Ephx1	epoxide hydrolase 1, microsomal(Ephx1)	2.992	0.00005
59	Fabp2	fatty acid binding protein 2, intestinal(Fabp2)	2.224	0.00005
60	Fabp4	fatty acid binding protein 4, adipocyte(Fabp4)	2.079	0.00005
61	Fabp5	fatty acid binding protein 5, epidermal(Fabp5)	0.076	0.00005
62	Fam198a	family with sequence similarity 198, member A(Fam198a)	0.482	0.00005
63	Fam25c	family with sequence similarity 25, member C(Fam25c)	0.168	0.00005
64	Fasn	fatty acid synthase(Fasn)	0.354	0.00005
65	Fdps	farnesyl diphosphate synthetase(Fdps)	0.346	0.00005
66	Fgl1	fibrinogen-like protein 1(Fgl1)	0.470	0.00005
67	Fitm1	fat storage-inducing transmembrane protein 1(Fitm1)	5.975	0.00005
68	Fkbp5	FK506 binding protein 5(Fkbp5)	2.865	0.00005
69	Gadd45g	growth arrest and DNA-damage-inducible 45 gamma(Gadd45g)	0.267	0.00005
70	Gas6	growth arrest specific 6(Gas6)	2.145	0.00005
71	Gm11127	predicted gene 11127(Gm11127)	2.441	0.00005
72	Gm3219	B-cell CLL/lymphoma 7C pseudogene(Gm3219)	0.401	0.00005
73	Gm6644	Akr1b3 pseudogene(Gm6644)	0.492	0.00005
74	Gpc1	glypican 1(Gpc1)	2.999	0.00005
75	Gstm2	glutathione S-transferase, mu 2(Gstm2)	2.275	0.00005
76	Gstm3	glutathione S-transferase, mu 3(Gstm3)	3.361	0.00005
77	H2-Aa	histocompatibility 2, class II antigen A, alpha(H2-Aa)	2.585	0.00005
78	H2-Ab1	histocompatibility 2, class II antigen A, beta 1(H2-Ab1)	2.325	0.00005
79	H2-Eb1	histocompatibility 2, class II antigen E beta(H2-Eb1)	3.240	0.00005
80	H2-Q5	histocompatibility 2, Q region locus 5(H2-Q5)	0.441	0.00005
81	Hes6	hairy and enhancer of split 6(Hes6)	0.459	0.00005
82	Hexb	hexosaminidase B(Hexb)	2.459	0.004
83	Hpgd	hydroxyprostaglandin dehydrogenase 15 (NAD)(Hpgd)	2.304	0.00005
84	Hsd17b11	hydroxysteroid (17-beta) dehydrogenase 11(Hsd17b11)	2.025	0.00005
85	Idi1	isopentenyl-diphosphate delta isomerase(Idi1)	0.351	0.00005
86	Igfbp2	insulin-like growth factor binding protein 2(Igfbp2)	0.483	0.00005
87	Inhba	inhibin beta-A(Inhba)	0.465	0.00005
88	Insig1	insulin induced gene 1(Insig1)	0.433	0.00005
89	Irs2	insulin receptor substrate 2(Irs2)	0.465	0.00005
90	Krt19	keratin 19(Krt19)	4.125	0.00005
91	Lcn2	lipocalin 2(Lcn2)	3.362	0.00005
92	Lpin1	lipin 1(Lpin1)	2.546	0.00005
93	Ly6a	lymphocyte antigen 6 complex, locus A(Ly6a)	8.768	0.00005
94	Ly6c1	lymphocyte antigen 6 complex, locus C1(Ly6c1)	8.054	0.00005
95	Ly6d	lymphocyte antigen 6 complex, locus D(Ly6d)	5.567	0.00005
96	Mfsd2a	major facilitator superfamily domain containing 2A(Mfsd2a)	4.328	0.00005
97	Mme	membrane metallo endopeptidase(Mme)	2.384	0.00005
98	Moxd1	monooxygenase, DBH-like 1(Moxd1)	0.020	0.00005
99	Mt2	metallothionein 2(Mt2)	2.602	0.00005
100	Mthfr	5,10-methylenetetrahydrofolate reductase(Mthfr)	0.401	0.00005
101	Mup21	major urinary protein 21(Mup21)	0.456	0.00005
102	Mvd	mevalonate (diphospho) decarboxylase(Mvd)	0.387	0.00005
103	Myl9	myosin, light polypeptide 9, regulatory(Myl9)	2.474	0.00005
104	Nfil3	nuclear factor, interleukin 3, regulated(Nfil3)	0.482	0.00005
105	Nlrp12	NLR family, pyrin domain containing 12(Nlrp12)	2.060	0.00005
106	Nr1d1	nuclear receptor subfamily 1, group D, member 1(Nr1d1)	3.334	0.00005

107	Nr1d2	nuclear receptor subfamily 1, group D, member 2(Nr1d2)	2.745	0.00005
108	Nsdhl	NAD(P) dependent steroid dehydrogenase-like(Nsdhl)	0.458	0.00005
109	Obp2a	odorant binding protein 2A(Obp2a)	7.848	0.00005
110	Omd	osteomodulin(Omd)	2.364	0.00005
111	Orm2	orosomucoid 2(Orm2)	2.307	0.00005
112	Osgin1	oxidative stress induced growth inhibitor 1(Osgin1)	0.448	0.00005
113	Pcsk9	proprotein convertase subtilisin/kexin type 9(Pcsk9)	0.343	0.00005
114	Pctp	phosphatidylcholine transfer protein(Pctp)	2.636	0.00005
115	Pmvk	phosphomevalonate kinase(Pmvk)	0.342	0.00005
116	Por	P450 (cytochrome) oxidoreductase(Por)	3.068	0.00005
117	Ppard	peroxisome proliferator activator receptor delta(Ppard)	0.226	0.00005
118	Rad51b	RAD51 paralog B(Rad51b)	3.079	0.00005
119	Rapgef4	Rap guanine nucleotide exchange factor (GEF) 4(Rapgef4)	2.154	0.00005
120	Rdh11	retinol dehydrogenase 11(Rdh11)	0.369	0.00005
121	Rdh16	retinol dehydrogenase 16(Rdh16)	3.376	0.00005
122	Rdh9	retinol dehydrogenase 9(Rdh9)	3.309	0.00005
123	Rec114	REC114 meiotic recombination protein(Rec114)	2.086	0.03665
124	Retsat	retinol saturase (all trans retinol 13,14 reductase)(Retsat)	2.056	0.00005
125	Rgs16	regulator of G-protein signaling 16(Rgs16)	4.933	0.00005
126	Rmrp	RNA component of mitochondrial RNAase P(Rmrp)	0.281	0.00005
127	Rpph1	ribonuclease P RNA component H1(Rpph1)	0.246	0.00005
128	Rprl3	ribonuclease P RNA-like 3(Rprl3)	0.301	0.00085
129	Rtn4	reticulon 4(Rtn4)	2.115	0.00005
130	Saa3	serum amyloid A 3(Saa3)	3.576	0.00005
131	Sh3bgrl2	SH3 domain binding glutamic acid-rich protein like 2(Sh3bgrl2)	2.345	0.00005
132	Slc16a7	solute carrier family 16 (monocarboxylic acid transporters), member 7(Slc16a7)	2.132	0.00005
133	Slco2a1	solute carrier organic anion transporter family, member 2a1(Slco2a1)	0.459	0.00005
134	Snord104	small nucleolar RNA, C/D box 104(Snord104)	0.000	0.0001
135	Tagln	transgelin(Tagln)	2.419	0.01895
136	Tceal8	transcription elongation factor A (SII)-like 8(Tceal8)	2.259	0.00005
137	Tef	thyrotroph embryonic factor(Tef)	3.055	0.00005
138	Tff3	trefoil factor 3, intestinal(Tff3)	0.135	0.0061
139	Tm4sf4	transmembrane 4 superfamily member 4(Tm4sf4)	2.699	0.00005
140	Tppp	tubulin polymerization promoting protein(Tppp)	2.242	0.00005
141	Tsku	tsukushi, small leucine rich proteoglycan(Tsku)	3.061	0.00005
142	Tstd1	thiosulfate sulfurtransferase (rhodanese)-like domain containing 1(Tstd1)	0.499	0.00005
143	Ugt1a1	UDP glucuronosyltransferase 1 family, polypeptide A1(Ugt1a1)	2.205	0.01135
144	Upp2	uridine phosphorylase 2(Upp2)	5.374	0.00005
145	Vnn3	vanin 3(Vnn3)	2.523	0.00005

Table S2. Differences in liver gene expression in animals fed HFLPD compared to HFD alone

S. No	Gene Symbol	Gene Name	Fold Changes	*P* value
1	9030619P08Rik	lymphocyte antigen 6 complex pseudogene(9030619P08Rik)	0.493	0.00005
2	Abcc3	ATP-binding cassette, sub-family C (CFTR/MRP), member 3(Abcc3)	0.373	0.00005
3	Alas1	aminolevulinic acid synthase 1(Alas1)	0.460	0.00005
4	Aldh3a2	aldehyde dehydrogenase family 3, subfamily A2(Aldh3a2)	0.448	0.00005
5	Avpr1a	arginine vasopressin receptor 1A(Avpr1a)	2.216	0.00005
6	BC002163	NADH dehydrogenase Fe-S protein 5 pseudogene(BC002163)	10.423	0.04860
7	Capn8	calpain 8(Capn8)	2.402	0.00005
8	Cck	cholecystokinin(Cck)	2.269	0.00005
9	Cd36	CD36 antigen(Cd36)	0.375	0.00005
10	Ces1g	carboxylesterase 1G(Ces1g)	0.356	0.00005
11	Cml5	Calmodulin-like protein 5	2.544	0.00005
12	Ctse	cathepsin E(Ctse)	0.382	0.00005
13	Cwc22	CWC22 spliceosome-associated protein(Cwc22)	0.237	0.00005
14	Cyp2a12	cytochrome P450, family 2, subfamily a, polypeptide 12(Cyp2a12)	2.902	0.00005
15	Cyp2a5	cytochrome P450, family 2, subfamily a, polypeptide 5(Cyp2a5)	2.061	0.00005
16	Cyp2b13	cytochrome P450, family 2, subfamily b, polypeptide 13(Cyp2b13)	0.201	0.00005
17	Cyp2b9	cytochrome P450, family 2, subfamily b, polypeptide 9(Cyp2b9)	0.351	0.00005
18	Cyp2c38	cytochrome P450, family 2, subfamily c, polypeptide 38(Cyp2c38)	0.273	0.00005
19	Cyp2c39	cytochrome P450, family 2, subfamily c, polypeptide 39(Cyp2c39)	0.243	0.00005
20	Cyp3a11	cytochrome P450, family 3, subfamily a, polypeptide 11(Cyp3a11)	0.460	0.00005
21	Cyp3a59	cytochrome P450, family 3, subfamily a, polypeptide 59(Cyp3a59)	0.397	0.00005
22	Cyp4a10	cytochrome P450, family 4, subfamily a, polypeptide 10(Cyp4a10)	0.186	0.00005
23	Cyp4a12b	cytochrome P450, family 4, subfamily a, polypeptide 12B(Cyp4a12b)	0.456	0.00005
24	Cyp4a14	cytochrome P450, family 4, subfamily a, polypeptide 14(Cyp4a14)	0.180	0.00005
25	Cyp7a1	cytochrome P450, family 7, subfamily a, polypeptide 1(Cyp7a1)	0.454	0.00005
26	Dbp	D site albumin promoter binding protein(Dbp)	0.355	0.04440
27	Dmbt1	deleted in malignant brain tumors 1(Dmbt1)	0.024	0.00005
28	Elovl3	elongation of very long chain fatty acids (FEN1/Elo2, SUR4/Elo3, yeast)-like 3(Elovl3)	2.786	0.00005
29	Fabp5	fatty acid binding protein 5, epidermal(Fabp5)	2.275	0.00005
30	Fam25c	family with sequence similarity 25, member C(Fam25c)	9.567	0.00005
31	Foxq1	forkhead box Q1(Foxq1)	2.324	0.00005
32	Gadd45g	growth arrest and DNA-damage-inducible 45 gamma(Gadd45g)	3.741	0.00005
33	Gas6	growth arrest specific 6(Gas6)	0.455	0.00005
34	Gm3219	B-cell CLL/lymphoma 7C pseudogene(Gm3219)	3.253	0.00005
35	Gstm2	glutathione S-transferase, mu 2(Gstm2)	0.430	0.00005
36	Gstm3	glutathione S-transferase, mu 3(Gstm3)	0.249	0.00005
37	H2-Eb1	histocompatibility 2, class II antigen E beta(H2-Eb1)	0.361	0.00005
38	Hopx	HOP homeobox(Hopx)	2.103	0.00005
39	Kcnk1	potassium channel, subfamily K, member 1(Kcnk1)	2.314	0.00005
40	Krt19	keratin 19(Krt19)	0.287	0.00005
41	Lpin1	lipin 1(Lpin1)	0.403	0.00005
42	Ly6a	lymphocyte antigen 6 complex, locus A(Ly6a)	0.172	0.00005
43	Ly6c1	lymphocyte antigen 6 complex, locus C1(Ly6c1)	0.166	0.00005
44	Ly6d	lymphocyte antigen 6 complex, locus D(Ly6d)	0.463	0.00160
45	Mfsd2a	major facilitator superfamily domain containing 2A(Mfsd2a)	0.352	0.00005
46	Moxd1	monooxygenase, DBH-like 1(Moxd1)	31.917	0.00005
47	Mup21	major urinary protein 21(Mup21)	2.180	0.00005
48	Myl9	myosin, light polypeptide 9, regulatory(Myl9)	0.405	0.00005
49	Rdh16	retinol dehydrogenase 16(Rdh16)	0.283	0.00005
50	Rdh9	retinol dehydrogenase 9(Rdh9)	0.350	0.00005
51	Rnaset2b	ribonuclease T2B(Rnaset2b)	0.175	0.00005
52	Saa3	serum amyloid A 3(Saa3)	0.448	0.00015
53	Scd1	stearoyl-Coenzyme A desaturase 1(Scd1)	0.290	0.00005

54	Serpina7	serine (or cysteine) peptidase inhibitor, clade A (alpha-1 antiproteinase, antitrypsin), member 7(Serpina7)	0.465	0.00005
55	Slc13a3	solute carrier family 13 (sodium-dependent dicarboxylate transporter), member 3(Slc13a3)	0.459	0.00005
56	Slc16a7	solute carrier family 16 (monocarboxylic acid transporters), member 7(Slc16a7)	0.487	0.00005
57	Snrnp25	small nuclear ribonucleoprotein 25 (U11/U12)(Snrnp25)	0.335	0.00005
58	Sult1a1	sulfotransferase family 1A, phenol-preferring, member 1(Sult1a1)	0.480	0.00005
59	Tceal8	transcription elongation factor A (SII)-like 8(Tceal8)	0.420	0.00005
60	Ubc	ubiquitin C(Ubc)	0.402	0.00005
61	Upp2	uridine phosphorylase 2(Upp2)	0.443	0.00005
62	Nlrp12	NLR family, pyrin domain containing 12	0.850	0.05117

Table S3. Compositions and Energy content of normal diet (AIN-93G) and High-fat diet (HFD45)

Formulations	AIN-93G		HFD 45%cal	
	g	kcal%	g	kcal%
Protein	20	20	24	20
Carbohydrate	64	64	41	35
Fat	7	16	24	45
kcal/kg	4,000		4,776	
Ingredient	**g**	**kcal**	**g**	**kcal**
Casein from milk	200	200	200	800
Corn starch	397.486	1590	155.036	620
Sucrose	100	400	50	200
Dextrose	132	528	132	528
Cellulose	50	0	50	0
Soybean Oil	70	630	25	225
Lard	0	0	175	1575
Minerals mixture	35	0	35	0
Vitamin mixture	10	40	10	40
TBHQ*	0.014	0	0.014	0
L-Cystine	3	15	3	12
Choline Bitartrate	2.5	0	2.5	0