BioTechnologia vol. 99(2) • 2018
Journal of Biotechnology, Computational Biology and Bionanotechnology SUPPLEMENTARY MATERIALS
http://doi.org/10.5114/bta.2018.75659

Transcriptome signature of the lactation process, identified by meta-analysis of microarray and RNA-Seq data

MOHAMMAD FARHADIAN[1], SEYED ABBAS RAFAT[1]*, KARIM HASANPUR[1], ESMAEIL EBRAHIMIE[2, 3, 4, 5]

[1] Department of Animal Science, Faculty of Agriculture University of Tabriz, Tabriz, Iran

[2] The University of Adelaide, Adelaide Medical, South Australia, Adelaide, Australia

[3] Institute of Biotechnology, Shiraz University, Shiraz, Fars, Iran

[4] School of Information Technology and Mathematical Sciences, Division of Information Technology, Engineering and the Environment, The University of South Australia, Adelaide, South Australia, Australia

[5] School of Biological Sciences, Faculty of Science and Engineering, Flinders University, Adelaide, South Australia, Australia

Abstract

Lactation plays the crucial role in mammals' life. Uncovering the transcriptome signature of lactation process helps to understand the molecular basis of milk production. To identify the genes that express differentially between early and late lactation, publicly available microarray transcriptomic datasets of dairy cattle were investigated and the array results were validated by a next-generation sequencing dataset (RNA-Seq data from sheep). Limma and edgeR packages were used for the analysis of the microarray and RNA-Seq datasets, respectively. Five common differentially expressed genes (DEGs), namely glutathione s-transferase mu 3 (*GSTM3*), EGF containing fibulin-like extracellular matrix protein 1(*EFEMP1*), fibulin 1(*FBLN1*), gelsolin (*GSN*), and fibrinogen-like 2 (*FGL2*), were identified. The involvement of *EFEMP1* in the lactation process has been reported for the first time. The identified DEGs are involved in the development of the immune system and cell differentiation of the mammary gland. A gene ontology network analysis revealed the key role of the *GSN* gene in the regulation of two important functions of actin nucleation and barbed-end actin filament capping. The gene ontology enrichment analysis showed that the function of calcium ion binding is statistically ($P < 0.05$) enriched by the identified transcriptomic signature. The approach presented in this study provides an integrative framework for finding the signature of the lactation process by utilizing global transcriptome data, gene ontology (GO) regulatory network, and enrichment analysis.

Key words: co-expression network, microarray, milk production, RNA-Seq

* Corresponding author: Department of Animal Science, Faculty of Agriculture University of Tabriz, Tabriz, Iran; e-mail: Rafata @tabrizu.ac.ir

Table S1. Highly co-expressed genes with EFEMP1 (1)

A	Gene	Function	Entrez Gene ID	Support-ability	Hsa MR for EFEMP1	Hsa2 MR for EFEMP1	Hsa3 MR for EFEMP1	Mmu MR for EFEMP1	Mmu2 MR for EFEMP1	Rno MR for EFEMP1	Cfa MR for EFEMP1	Gga MR for EFEMP1
0	EFEMP1	EGF containing fibulin-like extracellular matrix protein 1	2202	3	0	0	0	0	0	0	0	0
1	ABI3BP	ABI family	member 3 (NESH) binding protein	25890	3	5.9	13.3	78.8				
2	CCDC80	coiled-coil domain containing 80	151887	3	6.9	4.7	4	42.9	20.2	196.9	70	63.1
3	C1R	complement component 1	r subcomponent	715	3	8.2	8.9	120.3	106.5	324.9 238.7	331.6	223.3
4	C1S	complement component 1	s subcomponent	716	3	12.2	17.5	190.5		865.9 170.6	116.5	60.9
5	NNMT	nicotinamide N-methyltransferase	4837	3	15.2	4.9	46.1	169.3	44.6	8096.6	3422.5	
6	MGP	matrix Gla protein	4256	3	17.9	55	16.1	54.3	14.1	132.2		
7	CAV1	caveolin 1	caveolae protein	22kDa	857	3	18	39.5	24	17.1	13.6	57
8	PLSCR4	phospholipid scramblase 4	57088	3	19.5	36.4	39.6	94.2	632.4		548.2	
9	DCN	decorin	1634	3	20.6	19.8	44.7	11.5	15.9	14.7	34.2	16.6
10	AOX1	aldehyde oxidase 1	316	3	21.1	290.3	193.1	95.8	185.1	1829.7		6329.6
11	FSTL1	follistatin-like 1	11167	3	21.7	29.3	7.3	116.5	88.5	251.2	140.6	451.8
12	VGLL3	vestigial-like family member 3	389136	3	23.7	22.2	49.5	31.7	30.5			5284.1
13	LTBP2	latent transforming growth factor beta binding protein 2	4053	3	26.1	68.6	39.8	478.6	175.9	9554.8	12275.9	4026.5
14	NTN4	netrin 4	59277	3	26.7	315	23	5386.9	382.9		71.5	2538.6
15	LHFP	lipoma HMGIC fusion partner	10186	3	27	52.7	18.5	67.8	114.1	288.2	868.6	1
16	CTGF	connective tissue growth factor	1490	3	27.1	90.8	6.9	118.5	92.6	1232	442.6	272.6
17	CYBRD1	cytochrome b reductase 1	79901	3	27.5	28.7	50.6	2039.4	5441.4	336.8	262.1	688.8
18	CYR61	cysteine-rich	angiogenic inducer	61	3491	3	28.6	74.5	6.5	226.5	79.7	7039.8
19	PTRF	polymerase I and transcript release factor	284119	3	29	38.6	26.4	83.2	83.1			333.5
20	FBN1	fibrillin 1	2200	3	30.3	53.2	107	45.3	53.4	81.1	245.3	49.8
21	ECM2	extracellular matrix protein 2	female organ and adipocyte specific	1842	3	32.3	151.2	343.8	685	2946.1		9.2
22	CFH	complement factor H	3075	3	33.2	20.5	91.4		849.8	405.7	8.2	1997.2
23	100130506			100130506	0	33.2						
24	RBMS3	RNA binding motif	single stranded interacting protein 3	27303	3	36.5	8.3	86.3	187	206.5	342.4	146.7
25	ABCA8	ATP-binding cassette	sub-family A (ABC1)	member 8	10351	3	37.5	150.4	248.2	1897.1	2378.4	4344.2
26	AXL	AXL receptor tyrosine kinase	558	3	38.2	130.9	62.2	125.1	189.8		3952.3	
27	ALDH1A3	aldehyde dehydrogenase 1 family	member A3	220	3	38.5	817.8	89.5	5101.5	1069.7	861.7	
28	SPARC	secreted protein	acidic	cysteine-rich (osteonectin)	6678	3	42.8	207.1	126.5	214.2	56	578.2
29	IGFBP7	insulin-like growth factor binding protein 7	3490	3	45.1	46.6	28.9	138.5	151.2	170.6	1002.9	10.6

30	SRPX	sushi-repeat containing protein	X-linked	8406	3	45.7	58.4	40.6	200.7	47	145.2	698.5
31	LUM	lumican	4060	3	45.8	27.3	87.3	99	65.5	43.5	1266.5	62.8
32	ANTXR1	anthrax toxin receptor 1	84168	3	47	22.4	22.6	76.3	493.5	5880	4569.8	8955.6
33	COL12A1	collagen	type XII	alpha 1	1303	3	48.9	51.6	11.3	412	48.6	608.8
34	CRIM1	cysteine rich transmembrane BMP regulator 1 (chordin-like)	51232	3	50.5	82.9	33.9	477.4	155.5	736.5	948.4	223
35	CXCL12	chemokine (C-X-C motif) ligand 12	6387	3	51.1	102	125.5	95.2	15.4	226.7	116.4	1101.9
36	C3	complement component 3	718	3	51.5	123.7	776.5	474.6	1809.1	7735	2132.9	3190
37	AMOTL2	angiomotin like 2	51421	3	52.1	287.6	21	188.3	112.4		4933.8	4089.1
38	PTGIS	prostaglandin I2 (prostacyclin) synthase	5740	3	52.6	41.4	1444.6	69.6	301.3	2101.8		
39	IGFBP6	insulin-like growth factor binding protein 6	3489	3	54.4	318.2	108.3	20.2	14	10.5	270.8	
40	DKK3	dickkopf WNT signaling pathway inhibitor 3	27122	3	56.9	88.4	20.5	238.4	115.6	1437.2	61.7	1224.5
41	WWTR1	WW domain containing transcription regulator 1	25937	3	58	188.6	44.9	124.8	239.9	9960.2	217.6	
42	CAV2	caveolin 2	858	3	60.6	149.7	101.9	145.2	157	431.4	132.3	113.1
43	PRSS23	protease	serine	23	11098	3	61.2	39.9	19.3	28.2	15.3	160.8
44	PHLDB2	pleckstrin homology-like domain	family B	member 2	90102	3	62.9	1119.3	163.6	81.2	80	3957.5
45	MYOF	myoferlin	26509	3	63.5	75.6	50.4	1596.6	239.1	993	934	263.6
46	TAGLN	transgelin	6876	3	64.7	110.3	111.6	190.6	41	443.6	1250.7	365.2
47	HTRA1	HtrA serine peptidase 1	5654	3	65.2	111.3	4	86.9	411.7	3777.6		
48	ADH1B	alcohol dehydrogenase 1B (class I)	beta polypeptide	125	3	65.4	196	211				
49	LAMA4	laminin	alpha 4	3910	3	68	42.7	43.3	345.1	84	182.7	195.3
50	TIMP3	TIMP metallopeptidase inhibitor 3	7078	3	68.2	166.2	71.8	87.8	32.9	209.7	907.6	122.4
51	VEGFC	vascular endothelial growth factor C	7424	3	71.4	136.9	8.9	602.8	1505.3	1152.6	2778.5	595
52	FLRT2	fibronectin leucine rich transmembrane protein 2	23768	3	72.9	65.8	8.1	92.7	850.4		324	3842.3
53	GLT8D2	glycosyltransferase 8 domain containing 2	83468	3	73.7	88.6	78.6	327.4	473.5	3631.9	2081.1	663.1
54	PDGFRA	platelet-derived growth factor receptor	alpha polypeptide	5156	3	73.8	86.7	126	48.9	134.6	31.8	89.8
55	COL14A1	collagen	type XIV	alpha 1	7373	3	73.9	113.5	242.3	151	518.6	168
56	C10orf10	chromosome 10 open reading frame 10	11067	3	74	446.7	460.4	8250.6	2915.7	8591.4	1090.4	
57	CDH11	cadherin 11	type 2	OB-cadherin (osteoblast)	1009	3	75.9	109.6	21.5	100.1	230.6	309.7
58	ITGBL1	integrin	beta-like 1 (with EGF-like repeat domains)	9358	3	76	42.2	109.5	93.3	129.8	8.2	241.8
59	IL1R1	interleukin 1 receptor	type I	3554	3	76.5	98.9	530.8	1380.3	975.1	11259.1	7315.5
60	PDE1A	phosphodiesterase 1A	calmodulin-dependent	5136	3	78.8	134.8	220.2	2024.5	1573.1	4413	442.2
61	DAB2	Dab	mitogen-responsive	homolog 2	1601	3	78.8	129.5	66.9	352	520.6	257.3

			phosphoprotein	(Drosophila)								
62	GJA1	gap junction protein	alpha 1	43kDa	2697	3	78.8	173.4	30.7	237.8	406.6	762
63	ARHGAP29	Rho GTPase activating protein 29	9411	3	79.6	268.8	146.6	199.7	284.5		102.3	
64	THBS2	thrombospondin 2	7058	3	80.3	62.7	231.5	138.6	14	1171.6	2729.1	431.3
65	HEG1	heart development protein with EGF-like domains 1	57493	3	80.5	17	123.5	2888.1	256.8		7839	
66	MCC	mutated in colorectal cancers	4163	3	81.4	625.9	365.2	1024.5	1547.6		556.6	6641
67	CHRDL1	chordin-like 1	91851	3	82.4	166.2	418.4	116.4	18.4	29.3	6.9	661.8
68	PARVA	parvin	alpha	55742	3	84.1	68.6	8.9	84.1	16.1	3750.2	1648.3
69	NRP1	neuropilin 1	8829	3	84.2	280.3	52.9	483.8	1621.3	194.9	363.9	214.9
70	PPIC	peptidylprolyl isomerase C (cyclophilin C)	5480	3	84.5	143.9	66.4	316.5	543.7	474.7	706	667
71	AMIGO2	adhesion molecule with Ig-like domain 2	347902	3	85	286	130.2	6269.5	732.5	2196.4	3408.7	336.6
72	NEXN	nexilin (F actin binding protein)	91624	3	85	89	716.3	523.7	4964.9	1239.9		1029.2
73	COL3A1	collagen	type III	alpha 1	1281	3	85.3	111.1	87.3	46.4	12.6	88.5
74	HSPB8	heat shock 22kDa protein 8	26353	3	86	305.2	13.6	326.6	29.3	5129.6	739.9	2974.2
75	EHD2	EH-domain containing 2	30846	3	86.2	31.4	29.7	198.1	96.9	100.6	1424.8	
76	SULF1	sulfatase 1	23213	3	86.7	60.7	11.2	40.1	18.8	1653.1	5543.4	330.1
77	LOX	lysyl oxidase	4015	3	87.4	61.2	159.3	99.8	52.5	1347.2	770.1	426
78	TNFRSF11B	tumor necrosis factor receptor superfamily	member 11b	4982	3	90.7	105.9	338	649.1	189	1150.1	
79	PMP22	peripheral myelin protein 22	5376	3	90.9	153.4	37.4	107.8	25.5	69.4	148.7	134.6
80	DDR2	discoidin domain receptor tyrosine kinase 2	4921	3	91.7	65.1	191	7.5	110.9	8.1	354.1	262.8
81	MFAP5	microfibrillar associated protein 5	8076	3	92.1	25.8	1319.6	109.5	132	24.2	267.1	155.4
82	EDIL3	EGF-like repeats and discoidin I-like domains 3	10085	3	94.6	45	32.5	2533.7	3541.7		4218.1	1113
83	INMT	indolethylamine N-methyltransferase	11185	3	94.8	383.2	6947.4	339.3	236.5	3425.8		
84	MSRB3	methionine sulfoxide reductase B3	253827	3	97.1	177.7	244.9	151.8	412.2		959.9	868.6
85	SEMA3C	sema domain	immunoglobulin domain (Ig)	short basic domain	secreted	(sema-phorin) 3C	10512	3	97.1	36.4	298.2	11.2
86	THBS1	thrombospondin 1	7057	3	97.4	76.4	16.4	905.8	143.6		684.3	5527.5
87	POSTN	periostin	osteoblast specific factor	10631	3	97.4	110.4	30.8	163.6	183.4	350.5	698.3
88	CALD1	caldesmon 1	800	3	98.2	80.4	37.5				696.6	
89	GPX3	glutathione peroxidase 3 (plasma)	2878	3	99.8	119.7	440.3	284.2	291.5	280.1	1401.6	106.7
90	CFI	complement factor I	3426	3	100.3	219.7	376.8		2160	13505.9	67.8	10555.9
91	LPAR1	lysophosphatidic acid receptor 1	1902	3	102.1	191	146.1	153.3	209.8	203.3	120	610.8
92	SYNPO2	synaptopodin 2	171024	3	102.3	148	399.3	415.5	331.7	1185.8	9542.7	1272.8
93	COL1A2	collagen	type I	alpha 2	1278	3	102.8	148.1	96.5	51.4	6.6	128.6

94	FBLN1	fibulin 1	2192	3	103.9	98.5	102.4	1246	66.9	120.6	409.9	365.3
95	CLU	clusterin	1191	3	104	404.1	101.3	754.3	252.7	3215.7	5899.5	2167.3
96	COL4A1	collagen	type IV	alpha 1	1282	3	104.8	248.8	14.7	313.6	344.9	595
97	MAMDC2	MAM domain containing 2	256691	3	106.2	162.1	126.9	113.1	950.5	50.6	1706.7	4314.8
98	GALNT15	polypeptide N-acetylgalactosaminyltrans-ferase 15	117248	3	107	178.1	3051.2	320.4	518.2		39.2	7583.5
99	OLFML1	olfactomedin-like 1	283298	3	107.1	135.3	1892	145.6	185.9	9.8	12.4	11296.2
100	FGF2	fibroblast growth factor 2 (basic)	2247	3	109	270.4	73.9	2221.4	213.4	12619.3	1353	134.2

Table S2. Highly co-expressed genes with FBLN1

A	Gene	Function	Entrez Gene ID	Support-ability	Hsa MR for FBLN1	Hsa2 MR for FBLN1	Hsa3 MR for FBLN1	Mcc MR for FBLN1	Mmu MR for FBLN1	Mmu2 MR for FBLN1	Rno MR for FBLN1	Cfa MR for FBLN1	Gga MR for FBLN1	Dre MR for FBLN1	Cel MR for FBL-1
0	FBLN1	fibulin 1	2192	3	0	0	0	0	0	0	0	0	0	0	0
1	DCN	decorin	1634	3	2.5	12.2	118.9	54.4	335.1	968.3	386.8	53.2	159.3	2990.5	
2	MFAP4	microfibrillar-associated protein 4	4239	3	3.2	5.7	16.3		67.6	86.5	44	4.5			
3	COL14A1	collagen	type XIV	alpha 1	7373	3	4.9	20.9	40.1	59	484.9	2185.9	175.1	76.5	1345.7
4	CCDC80	coiled-coil domain containing 80	151887	3	5.8	64	103.5	16.1	703.4	519.7	276.8	292	349.9		
5	DPT	dermatopontin	1805	3	6.5	22.1	191.4		167.8	228		561.4			
6	FBLN2	fibulin 2	2199	3	6.8	24.4	103		195.5	88.7	26.7	116	81		
7	GLT8D2	glycosyltransferase 8 domain containing 2	83468	3	7.8	19.2	111.3	215.6	388	7139.1	464	1448.7	1509.6		
8	219928			219928	0	14.1									
9	OLFML1	olfactomedin-like 1	283298	3	14.7	24.7	288.7		738.8	3908.6	1328.8	133.1	7115.2		
10	MMP2	matrix metallopeptidase 2 (gelatinase A	72kDa gelatinase	72kDa type IV collagenase	4313	3	14.7	41	47.8	161.9	58.9	72.1	188.9	218.3	47.4
11	SVEP1	sushi	von Willebrand factor type A	EGF and pentraxin domain containing 1	79987	3	15	2.2	50.7	848.7	116.8	133.7	328.6	293.5	7163.9
12	ACAN	aggrecan	176	0	15.5	2518.6	581.2							1026.8	
13	PODN	podocan	127435	3	15.8	19.4	82.2		1236.3	732.1			12238.3		
14	PTGIS	prostaglandin I2 (prostacyclin) synthase	5740	3	16.3	26.1	114.8	118.5	443.8	558.7	301.2			5615.9	
15	FBLN5	fibulin 5	10516	3	18.2	25.2	192.1	144.9	1329	489.9	576.9	1949	342.8		
16	PDGFRA	platelet-derived growth factor receptor	alpha polypeptide	5156	3	18.4	22.4	109.2		234.9	412.2	582.1	36.4	3116.3	1811.1
17	OMD	osteomodulin	4958	3	18.7	34.7	361	277.4	1659.5	11409.2					
18	CADM3	cell adhesion molecule 3	57863	0	19.4	3177.3	842.5	9643.9	5323.5	9696.2	1713	4402.6	13002	2463.6	
19	OGN	osteoglycin	4969	3	19.8	43.8	186.3	31	331.4	300.9	448.3	3610	619.1		
20	SERPINF1	serpin peptidase inhibitor	clade F (alpha-2 antiplasmin	pigment epithelium derived factor)	member 1	5176	3	22	5.1	206.8		577.6	538.4	313.8	97.8
21	PCOLCE	procollagen C-endopeptidase enhancer	5118	3	22.6	10.1	31.7	130.4	184.3	99.3	78.5	43.7			
22	WNT6	wingless-type MMTV integration site family	member 6	7475	0	23.1	7564.9	7284.2	5719.2	1735	179.6	1064.9	7121.6	7237	
23	SLIT3	slit homolog 3 (Drosophila)	6586	3	23.9	45.1	100.3	145.9	162.3	109.2	241.7	60.9	1691.1	290.7	
24	SFRP2	secreted frizzled-related protein 2	6423	3	24.8	35.3	109.7		210.1	13.5	349.8	389.9	1084		1763
25	C1R	complement component 1	r subcomponent	715	3	25.1	10	62.8		1885.2	4215.2 3358.2	449.5	8.5	217	
26	PDGFRL	platelet-derived growth factor receptor-like	5157	3	26.3	31.4	219.4		539.7	555.4	234.7	276.9	322.3		

27	OLFML3	olfactomedin-like 3	56944	3	26.4	21.4	13.4		325.4	879.3	30.3	76.8	162.5	3934.6	
28	SFRP4	secreted frizzled-related protein 4	6424	3	27.9	81.2	327.3	1219.7	752.5	275.7	1286.2	45.6	6594.5		
29	COL6A2	collagen	type VI	alpha 2	1292	3	29.1	42.4	96.6	59.5	96.5	40	43.5		183.7
30	LCE1E	late cornified envelope 1E	353135	0	30.2	11206.5	13899.8								
31	C1S	complement component 1	s subcomponent	716	3	31.4	13	51.3	395		4774.5 2102.8	371.7	6.3	490.7	
32	AK8	adenylate kinase 8	158067	1	33	10250.5	14598.3	5762.4	12643.5	18503		8830.5	13089.6		
33	MFAP5	microfibrillar associated protein 5	8076	3	33.7	49.4	370.5	589.8	257.8	430.2	83.5	141.1	834		
34	CSMD2-AS1	CSMD2 antisense RNA 1	402779	0	34.9										
35	PRRX1	paired related homeobox 1	5396	3	35.5	69.4	441.3	434.6	536.9	991.9	558.2	420	550.3	712.8 1443.5	
36	ASPN	asporin	54829	3	36.4	124	378.6		362	323.6	862	287.6	2843	3445.2	
37	ISLR	immunoglobulin superfamily containing leucine-rich repeat	3671	3	36.7	34.6	122	2454.7	129.2	183.2	41.2	43.4	219.7		
38	ECM2	extracellular matrix protein 2	female organ and adipocyte specific	1842	3	36.7	75.1	176.6	71.7	2528.6	8835.5		488.9	175.5	
39	PLAC4	placenta-specific 4	191585	1	37.5	6721.1	7607.1								
40	MXRA8	matrix-remodelling associated 8	54587	3	37.5	832.6	109.1	1182.1	372.4	414.5	70.5	63.3	115	1722.8	
41	FBN1	fibrillin 1	2200	3	37.8	64.2	144.9	51.4	168.8	71.6	77.6	445.9	213.3		
42	ZNF843	zinc finger protein 843	283933	0	39	7423.7									
43	CLDN4	claudin 4	1364	2	39.2	8662.1	1631.2	5750.7	6352.2	408.2	1522.3		9175.8	7154.7 8557.0	
44	SPON1	spondin 1	extracellular matrix protein	10418	3	40.7	82.5	93.2		929	2230.4	120	1790.7	6270	1701.5
45	LOC100132005	uncharacterized LOC100132005	100132005	0	42.2	11817.8									
46	LOC401312	uncharacterized LOC401312	401312	0	43.5										
47	BOC	BOC cell adhesion associated	oncogene regulated	91653	3	44.9	31	38.1	3.3	2062.4	394	80.4	2164.6	1601.9	76.3
48	PDGFRB	platelet-derived growth factor receptor	beta polypeptide	5159	3	45.3	20.9	73.3		221.2	265.5	2467	524	11310.1	
49	TWIST2	twist family bHLH transcription factor 2	117581	3	45.4		39.8	10973.4	577.5	64.3	692.2	1300	2058.2		
50	LOC284395	uncharacterized LOC284395	284395	0	45.9										
51	OR7E104P	olfactory receptor	family 7	subfamily E	member 104 pseudogene	81137	0	46.1							
52	GAS1	growth arrest-specific 1	2619	3	46.3	459.8	47.4		120.4	55.5	1684.4	29.5		2698.2	
53	NAV2-AS4	NAV2 antisense RNA 4	399876	0	46.4										
54	OSR2	odd-skipped related transciption factor 2	116039	3	48	35.5	1807.5	219.5	2378.9	350.9	1989.2	1243	10322.7		

55	ELN	elastin	2006	3	48.6	177.7	93.1	10930.4	282.4	195.4	160		1001.8		
56	PRELP	proline/arginine-rich end leucine-rich repeat protein	5549	3	51.7	53.8	144.7		745.6	2620.4	275.9	431.3	11725.3		
57	LAMA2	laminin	alpha 2	3908	3	51.9	48	107.1	84.5	446.7	1631.2	241.1		2870.1	
58	COL16A1	collagen	type XVI	alpha 1	1307	3	52.1	763.3	39.2	71.2	545.9	241.8	354	392.3	12002
59	IGF1	insulin-like growth factor 1 (somatomedin C)	3479	3	52.9	112.9	2153.6	182.7	4332.3	10894.9	2507.8	605.7	10304.2	1745.9	
60	FIBIN	fin bud initiation factor homolog (zebrafish)	387758	3	53.2	70.8	66.1	7.8	521	855.9	291.7	4049.7	355.6		
61	TMEM119	transmembrane protein 119	338773	3	53.3	43	179.7	2981.7	264.7	943.5	201.8	55.3	446.6		
62	ZNF664	zinc finger protein 664	144348	0	54.4	14594.5	9355.2	10642.9	14558.9	7092.3					
63	NXN	nucleoredoxin	64359	3	56.2	148.9	45.5		514.5	72.1	1570.2	4846.1	2123.3		
64	RNF157	ring finger protein 157	114804	0	60.6	10044.9	12787.9		1396.6	7285.5	7415	13764.6	11661		5834.1
65	AEBP1	AE binding protein 1	165	3	62.1	45	160		97.2	162	77.8	134.8			
66	COL1A2	collagen	type I	alpha 2	1278	3	62.4	41.8	93.5	95.7	154.8	97.7	95	216.1	13.1
67	SMOC2	SPARC related modular calcium binding 2	64094	3	62.5	76.2	139.9		470.5	466.9	1136.7	99.2	1270.8		1180.9
68	SLIT2	slit homolog 2 (Drosophila)	9353	3	63.8	201	97.7	1484.8	1492	286.5	3281.8	796	4922.5	6293.9	288.3
69	C19orf84	chromosome 19 open reading frame 84	147646	0	65.1		16425.5								
70	SRPX	sushi-repeat containing protein	X-linked	8406	3	65.5	106.8	213.7	199	402.8	118.7	124.1	363.9	1658.1	
71	LOXL4	lysyl oxidase-like 4	84171	0	66.1	1101	215.6		2606.5	764.4		1454.9	11198.2		
72	WISP2	WNT1 inducible signaling pathway protein 2	8839	3	66.2	1168.4	230.9	6558.6	721	637.4	553.9	6680.6			
73	COL12A1	collagen	type XII	alpha 1	1303	3	66.4	106.7	176.3	569.4	434.3	185.5	542.1	2599.9	234.1
74	GPR52	G protein-coupled receptor 52	9293	1	66.5	15869.5		11158.6							
75	ZCCHC24	zinc finger	CCHC domain containing 24	219654	3	66.5	108.3	183.9		1901.3	2217.6	3315.4	1659.3	264.6	
76	DDR2	discoidin domain receptor tyrosine kinase 2	4921	3	67.2	66.9	417.4	202.8	353	844.7	169.7	713.1	741.3		2548.5
77	COLEC12	collectin sub-family member 12	81035	3	67.5	31.5	250.3	131.5	1007.4	7230	58.8	1	242.4	2238.8	
78	OR51B5	olfactory receptor	family 51	subfamily B	member 5	282763	1	68.3	17904.9	17344.9	13987.6				
79	LRRN4CL	LRRN4 C-terminal like	221091	3	68.7	538.6	1298.4		487.6	3411	1258.4				
80	FMOD	fibromodulin	2331	3	68.9	52	181.7	8.7	623.4	1357.8	81.8	436.3	6561.6		
81	SDK1	sidekick cell adhesion molecule 1	221935	3	69.6	842.2	306.8		1080.2	723.7	3810.7	3419.1	12087		
82	COL6A1	collagen	type VI	alpha 1	1291	3	71	48.9	92.1	62.3	213.2	175.7	101	126.5	298.9
83	MXRA5	matrix-remodelling associated 5	25878	3	71.2	49.6	31	1803.5				169.9	242.2		
84	LTBP2	latent transforming growth factor beta binding protein 2	4053	3	73.8	173.3	529.4	244.6	1429.6	592.4	923.6	4134.1	7333.5		
85	PCDH18	protocadherin 18	54510	3	74.3	18.2	82.7	310.4	835.5	523.7	2410.9		1808		
86	ZNF423	zinc finger protein 423	23090	3	74.3	555.5	129.4	2044.5	1203.9	802.9	1387.1	98.3	5756.5	3541.6	
87	CXCL12	chemokine (C-X-C motif) ligand 12	6387	3	75.5	88.7	245.4	1704.3	3318.6	375.8	1465.2	99.2	319.8		

88	OR2H1	olfactory receptor	family 2	subfamily H	member 1	26716	1	75.9	12681.1						
89	CXCL14	chemokine (C-X-C motif) ligand 14	9547	3	76	172.4	420.4		1570.8	2431.6	2900.1	38	7873	3834.6	
90	PLAC9	placenta-specific 9	219348	3	77.2	1986	165.9	320.8							
91	BACH1	BTB and CNC homology 1	basic leucine zipper transcription factor 1	571	2	78.1	10264	9744.9	5216.4	13760.1	5428.7	3837.3	3909.8	5243.9	
92	ADRBK1	adrenergic	beta	receptor kinase 1	156	0	79.5	11553.3	19269.7	11372.1	16365.7	12781.4	8792.8	10547.2	7571.9
93	HDGFL1	hepatoma derived growth factor-like 1	154150	1	79.7	12073.5									
94	WHAMMP2	WAS protein homolog associated with actin	golgi membranes and microtubules pseudogene 2	440253	0	79.7		14398							
95	CTSK	cathepsin K	1513	3	80	59.9	537	281.3	1481.6	2769.8	87.9	306.2	87.6	3647.2	
96	EFEMP2	EGF containing fibulin-like extracellular matrix protein 2	30008	3	80.2	105.9	228.8	129.4	788.5	160.2	13.5	296.4			
97	H19	H19	imprinted maternally expressed transcript (non-protein coding)	283120	3	80.8	227.9	257							
98	GUCA1C	guanylate cyclase activator 1C	9626	1	80.9	18034.5						11720.6	13025.8		
99	CCM2L	cerebral cavernous malformation 2-like	140706	2	83.1	3346.4	1920		6217.9	5757	1393.2	8251.6	11131.3		
100	EHMT1-IT1	EHMT1 intronic transcript 1	643210	0	83.2	13323.4									

Table S3. Highly co-expressed genes with FGL2

A	Gene	Function	Entrez Gene ID	Supportability	Hsa MR for FGL2	Hsa2 MR for FGL2	Hsa3 MR for FGL2	Mcc MR for FGL2	Mmu MR for FGL2	Mmu2 MR for FGL2	Rno MR for FGL2	Cfa MR for FGL2	Gga MR for FGL2	Dre MR for FGL2
0	FGL2	fibrinogen-like 2	10875	3	0	0	0	0	0	0	0	0	0	0
1	MPEG1	macrophage expressed 1	219972	3	2	18.2	4.4		100.2	341.6	508.5	500.2		
2	TLR8	toll-like receptor 8	51311	3	6	23.8	7.9	137.1	787.6	598.5				
3	MS4A6A	membrane-spanning 4-domains	subfamily A	member 6A	64231	3	6.9	10	14.5	241.1	28.1	711.6	89.9	11570.2
4	CX3CR1	chemokine (C-X3-C motif) receptor 1	1524	3	7.5	88.5	151.7	8522.5		2562.7	3793.7		1041.7	
5	IGSF6	immunoglobulin superfamily	member 6	10261	3	9.2	18.1	26.5		84.6	567.6	41		29.9
6	MS4A7	membrane-spanning 4-domains	subfamily A	member 7	58475	3	10.4	52.2	5.8	132.8	142.6	217.2	498	2882.3
7	MNDA	myeloid cell nuclear differentiation antigen	4332	3	10.9	35.9	40.8					2940.9		
8	GIMAP4	GTPase	IMAP family member 4	55303	3	13	32	75.4		478.6	406.6	407.9	888	
9	RNASE6	ribonuclease	RNase A family	k6	6039	3	13.5	34	83.2	194	411.3	489.5		
10	AMICA1	adhesion molecule	interacts with CXADR antigen 1	120425	3	14	10.2	49.6	422.2		941.2		246.4	
11	TNFSF13B	tumor necrosis factor (ligand) superfamily	member 13b	10673	3	14.4	58.3	125.5	355	499.7	1977.7		1942.1	582.7
12	KCTD12	potassium channel tetramerization domain containing 12	115207	3	14.6	109.7	419.6		57.5	424.7		4582.9		544.6 1818.9
13	CD14	CD14 molecule	929	3	15.2	89.8	61.4	424.2	149.6	108.5	297.2	523.1		
14	CD302	CD302 molecule	9936	3	16.7	43.8	16.9		525.9	836	236.9			
15	AOAH	acyloxyacyl hydrolase (neutrophil)	313	3	17	22.4	91.2	564	458.7	2970.7		433.9	1210.9	
16	CLEC7A	C-type lectin domain family 7	member A	64581	3	17.2	25.7	125.7	250.4	80	440.3	184.5	998.4	
17	1-Mar	membrane-associated ring finger (C3HC4) 1	E3 ubiquitin protein ligase	55016	3	18.4	57	174.2	1468.2	318	2795.1		6208	
18	P2RY13	purinergic receptor P2Y	G-protein coupled	13	53829	3	19	19.1	13.6		405.4	884.5		
19	TYROBP	TYRO protein tyrosine kinase binding protein	7305	3	20.4	41	33.3	233.8	46.1	303.5	49.9	619.2		
20	LRRK2	leucine-rich repeat kinase 2	120892	3	20.5	13.2	30.6	1469.5	1823.9	1201		202.4	2153.9	
21	CTSS	cathepsin S	1520	3	21	33	17.7	52.8	123	488.6	20.1	364.4	1719.8	53.9 795.3
22	DPYD	dihydropyrimidine dehydrogenase	1806	3	21.8	115.4	384		6527.7	6377.5	4642.6	1447.5	1019.9	5876.5
23	SAMHD1	SAM domain and HD domain 1	25939	3	21.9	86.1	58.7		155.9	782		5632.3	3660.7	
24	AIF1	allograft inflammatory factor 1	199	3	22.1		184.7	346.7	151.4	437	322.1	394.5		
25	GIMAP6	GTPase	IMAP family member 6	474344	3	22.4	119.8	135.8		1066.4	883	1785.3	1815	
26	CLEC10A	C-type lectin domain family 10	member A	10462	3	22.4	115	34.6	4783.4	212.5 364.9	1447.5 6202.9	81.2	846.5	

27	FCER1G	Fc fragment of IgE	high affinity I	receptor for	gamma polypeptide	2207	3	22.9	36.6	80.2		18.6	278.8	28.7
28	CLEC4A	C-type lectin domain family 4	member A	50856	3	23.5	58.6	169.8	88.4	130.2	937.9	353.4		
29	LGALS2	lectin	galactoside-binding	soluble	2	3957	3	24.8	160.2	64.2	7360.3	9522.1	3217.6	7430.9
30	ENTPD1	ectonucleoside triphosphate diphosphohydrolase 1	953	3	25.1	62.5	420.4	30.4	49.9	30.2	155.4	2240.8	11553.9	
31	GIMAP8	GTPase	IMAP family member 8	155038	3	26.2	76.5	75.9	271.1	879.1	1745.9		1690.9	1658.9
32	P2RY14	purinergic receptor P2Y	G-protein coupled	14	9934	3	28.5	67.2	19.9		13.7	531	132.9	2031.6
33	PTPRC	protein tyrosine phosphatase	receptor type	C	5788	3	29	36	77		24.1	399.5	14.4	2032.1
34	CYBB	cytochrome b-245	beta polypeptide	1536	3	29.6	9.3	41	124.2	74.8	164	88.8	908.4	343.1
35	MS4A4A	membrane-spanning 4-domains	subfamily A	member 4A	51338	3	29.7	67.5	49	113.1		222.7		9224.5
36	CSF1R	colony stimulating factor 1 receptor	1436	3	29.8	37	66	583.7	250.2	924	70.2	211.3	44.5	68.1
37	CCR1	chemokine (C-C motif) receptor 1	1230	3	29.9	96.3	67.2	560.5	74.8	9.8	213.4	2940.8		
38	CASP1	caspase 1	apoptosis-related cysteine peptidase	834	3	30.9	41.7	301.7	20.9		107.7	41.8	518.8	6081.2
39	GIMAP1	GTPase	IMAP family member 1	170575	3	32.2	235	57.6		2063.4	2462.6	1377.6		
40	C1orf162	chromosome 1 open reading frame 162	128346	3	32.2	58.7	137.7	284.8		1066.6				
41	SECTM1	secreted and transmembrane 1	6398	3	34.4	242.6	683.4		234.5	748.1				
42	FYB	FYN binding protein	2533	3	35.9	49.6	274.6		108.3	383.1		382.2	431.8	
43	FCGR2A	Fc fragment of IgG	low affinity IIa	receptor (CD32)	2212	3	35.9	77	36.7		30.9	538.3		
44	FAM198B	family with sequence similarity 198	member B	51313	3	37.1	267.8	857.6	786.8	1132.9	1667.4	568.8		1283.4
45	FCGR1B	Fc fragment of IgG	high affinity Ib	receptor (CD64)	2210	3	37.7	92.3	183.5					
46	HNMT	histamine N-methyltransferase	3176	3	38.6	451.4	267.6	754.3 7723.8	665.4	9234.7	10248.7	4.7	2160	7561.6
47	LYZ	lysozyme	4069	3	38.9	50.9	25.1	318.5	50.9 46.0	110.6 80.5	120.5	1065	317.2	
48	CD163	CD163 molecule	9332	3	39.1	53.5	12	51.6	662.1	1974.5	34.2	666.9		
49	C1QA	complement component 1	q subcomponent	A chain	712	3	40	79.5	15.3	425.6	221.4	436.8	77.1	2085.6
50	RGS18	regulator of G-protein signaling 18	64407	3	40.4	163.8	68.9	340.1	186.5	551.4		507.4	1173.1	
51	CECR1	cat eye syndrome chromosome region	candidate 1	51816	3	40.7	44.8	20	861.1				2381.8	2896.8
52	CARD16	caspase recruitment domain family	member 16	114769	3	41.1	112.3	404.7						
53	LILRB2	leukocyte immunoglobulin-like receptor	subfamily B (with TM and ITIM domains)	member 2	10288	3	41.2	119	35.4					5168.5
54	CD86	CD86 molecule	942	3	41.2	38	123.5	290	114.4	96.7	122.4	642.9	62.5	
55	CPVL	carboxypeptidase	vitellogenic-like	54504	3	41.9	40.6	399.2	3522.5	13200.4			1146	
56	SLC7A7	solute carrier family 7 (amino acid transporter light chain	y+L system)	member 7	9056	3	42.9	166.6	76.6		911	5750.4	472.6	
57	PILRA	paired immunoglobin-like type 2	29992	3	44.2	190.4	343.4		319.2	2480	478.9	719.3		

		receptor alpha												
58	LST1	leukocyte specific transcript 1	7940	3	44.7		178.7							
59	GPR34	G protein-coupled receptor 34	2857	3	45.2	149.6	20.4	5921.5	251.9	1341.7			15.4	
60	HCK	HCK proto-oncogene	Src family tyrosine kinase	3055	3	45.9	121.7	201.2		137.4	967.3	38	4446.3	1049
61	NCF2	neutrophil cytosolic factor 2	4688	3	45.9	101.1	199	243.4	189.6	462		3594.3	908.5	
62	GIMAP7	GTPase	IMAP family member 7	168537	3	46	50.1	140		1377.7	984.8	635.5		
63	IFI30	interferon	gamma-inducible protein 30	10437	3	46.7	201.2	599.8	178.8	875.4	1754.6	461.6	2067.4	1242
64	FCN1	ficolin (collagen/fibrinogen domain containing) 1	2219	3	46.9	312.7	20.3	3196.6	6560.8	2041.8	395.1	7992.1	4041	
65	PECAM1	platelet/endothelial cell adhesion molecule 1	5175	3	47	85.9	49	151.4	773.2	6778.4	132.9	231.9	956.7	
66	AP1S2	adaptor-related protein complex 1	sigma 2 subunit	8905	2	47.6	664.1	2605.1	2322.8	475.1	7368.4	172.5	2983.9	7611
67	C1QB	complement component 1	q subcomponent	B chain	713	3	48	59.5	28.1		167.5	514.6	89.3	1412.5
68	GGTA1P	glycoprotein	alpha-galactosyltransferase 1 pseudogene	2681	3	48.7	70.1	63.3						
69	IL10RA	interleukin 10 receptor	alpha	3587	3	49.2	87.2	151.7	462	220.5	94.7	5382.1	605.8	7412.2
70	TLR4	toll-like receptor 4	7099	3	49.7	75.7	214.2	60.7	76	49.5	135	972.8	142.4	
71	RTN1	reticulon 1	6252	3	52.8	344.9	1490.7	11857.1	8385.3	15669.3	9266.1	11787.5	11412.4	4528.6
72	C3AR1	complement component 3a receptor 1	719	3	53	58.2	55.5		218	445.8	248.4	180.6	56.5	
73	LY96	lymphocyte antigen 96	23643	3	53	422.5	328.6	5.2	229.8	1633.3	304	1284		
74	SIGLEC7	sialic acid binding Ig-like lectin 7	27036	3	53.5	1052.8	81.5							
75	SLC9A9	solute carrier family 9	subfamily A (NHE 9)	cation proton antiporter 9)	member 9	285195	3	54.1	39.5	218	321.5	1172.1	824.5	1223.2
76	HLA-DMB	major histocompatibility complex	class II	DM beta	3109	3	54.9		261.6		1278	84.7 141.5		1126.7
77	GLIPR2	GLI pathogenesis-related 2	152007	3	55.5	97.9	1145.8	3478	439.7	936.7			4653.2	6483
78	FCGR3B	Fc fragment of IgG	low affinity IIIb	receptor (CD16b)	2215	3	55.9		66.8	244	75.5	368	145.2	708
79	LILRA1	leukocyte immunoglobulin-like receptor	subfamily A (with TM domain)	member 1	11024	3	56.4	267.2	100.9	6457.6				
80	EVI2B	ecotropic viral integration site 2B	2124	3	57.2	183.8	106.4	216.2	135.2	320.6 359.4		477.4	392	
81	SIGLEC10	sialic acid binding Ig-like lectin 10	89790	3	57.3	580.9	254.8	3707.6	6737	629.4	3018.3	13536.6		
82	HLA-DPB1	major histocompatibility complex	class II	DP beta 1	3115	3	57.9	71.6	327.1	618.2				
83	CD300LF	CD300 molecule-like family member f	146722	3	58	800.8	127	611.3		887		8627.7		
84	TNFRSF1B	tumor necrosis factor receptor superfamily	member 1B	7133	3	58	239.8	56.6	3609.4	165.6	172.8	665.4	8007	5173.3
85	FGR	FGR proto-oncogene	Src family tyrosine kinase	2268	3	58.6	419.7	159.2	909	473.6	1109.8	233.5	476.3	5604.1
86	HLA-DPA1	major histocompatibility complex	class II	DP alpha 1	3113	3	58.9		257.2	367.6				
87	SLC31A2	solute carrier family 31 (copper transporter)	member 2	1318	3	59	379.5	2353.6	395.2	388.5	1057	1234.1	6312.8	9522

88	ADAP2	ArfGAP with dual PH domains 2	55803	3	59	136.9	90.8	895.4	560.6	1655.6	2193.3	2486.9	429.4	
89	SLC40A1	solute carrier family 40 (iron-regulated transporter)	member 1	30061	3	59.7	182.1	491.4	322.8	2266.7	5976.2	961.5	5676.2	578.1
90	GLIPR1	GLI pathogenesis-related 1	11010	3	59.8	580.1	894.4	5177.9	244.2	827.2	58.8	35.2	10276.8 673.0	
91	NLRC4	NLR family	CARD domain containing 4	58484	3	60.3	194.1	177.1	8926.4		2435.7			
92	HLA-DRB1	major histocompatibility complex	class II	DR beta 1	3123	3	60.8		256.2	1113				
93	MAFB	v-maf avian musculoaponeurotic fibrosarcoma oncogene homolog B	9935	3	61.5	298.1	391.4		1074.7	1008.9	606.4		4512.7	
94	ITGAM	integrin	alpha M. (complement component 3 receptor 3 subunit)	3684	3	62.2	207.6	154.5		212.7	745.9	787.9	365	
95	PTPRJ	protein tyrosine phosphatase	receptor type	J	5795	3	62.5	302.1	121.3	879.5	1335.8	1722.3	518.3	10632.3
96	C10orf54	chromosome 10 open reading frame 54	64115	3	62.7	298.7	321.3		239.6	642.5	62.5		1957.9	19
97	SCPEP1	serine carboxypeptidase 1	59342	3	64.1	128.7	2726.3	1842.8	2542.8	1273.3	1685	4318.5	159.3	1359.5
98	GPR65	G protein-coupled receptor 65	8477	3	64.9	81.9	33.7	124.9	59.8	213.1		1250.8	43.8	
99	TLR7	toll-like receptor 7	51284	3	65	139.6	263	4691.5	386.5	495.5	183.4		71.3	
100	CD4	CD4 molecule	920	3	65.1	71.2	40.2	917.1	7864.1	2219.5	116.9	1422.9	4821.8	

Table S4. Highly co-expressed genes with GSN

A	Gene	Function	Entrez Gene ID	Supportability	Hsa MR for GSN	Hsa2 MR for GSN	Hsa3 MR for GSN	Mcc MR for GSN	Mmu MR for GSN	Mmu2 MR for GSN	Rno MR for GSN	Cfa MR for GSN	Gga MR for GSN
0	GSN	gelsolin	2934	3	0	0	0	0	0	0	0	0	0
1	CYB5R3	cytochrome b5 reductase 3	1727	2	6.9	69.2	173.8	13399.3	2643.7	159.3	3518.4	176.8	386.7
2	NDRG2	NDRG family member 2	57447	3	9.3	476.9	753.6		2193.2	1943.8	4549	1556.8	
3	EPAS1	endothelial PAS domain protein 1	2034	3	14.5	38.5	106.4	59.5	570.6	185.1	4656.4	801.4	9621.9
4	TGFBR2	transforming growth factor	beta receptor II (70/80kDa)	7048	3	15.3	72.4	76	420.3	39	32.5	4236.7	77.7
5	ARHGAP1	Rho GTPase activating protein 1	392	1	15.8	132.4	378.5		775.7	159.9	1627.6	60.5	11460.3
6	LAMP1	lysosomal-associated membrane protein 1	3916	3	16.6	71.8	235.8		308.3	193.3	414	304	2716.4
7	CPNE2	copine II	221184	3	16.6	413.4	1162	1487.9	997.9	650.8	252.9	343.3	9693.5
8	STOM	stomatin	2040	3	17.3	36.1	56.1	284.5	2033.2	954.8	279.4	4.5	187.4
9	INPP5A	inositol polyphosphate-5-phosphatase	40kDa	3632	1	19.1	130.1	190.2		49	3731.3	1733.1	98.9
10	WDR1	WD repeat domain 1	9948	3	19.1	291.2	737.3	230.4	543.2	5.3	578.5	2416.8	527.8
11	PLEC	plectin	5339	3	25.9	182.9	933.1	61.4	127.4	9.1	988.9	2658.4	
12	CTNNA1	catenin (cadherin-associated protein)	alpha 1	102kDa	1495	2	28.4	141.2	308.8	405.7	768.6	1268.9	275.7
13	DAPK3	death-associated protein kinase 3	1613	2	30.1	2417.1	566.5	51	2093.5	6521.4	6579.8	4033.4	
14	TAPBP	TAP binding protein (tapasin)	6892	3	31.9	836.5	5740	282.3	1046.1	305.1	4924.6	2492.8	2042.9
15	CD276	CD276 molecule	80381	3	34.6	987.4	348.7	395.2	8890.5	4613	998.4	851.1	4964.4
16	COL6A1	collagen	type VI	alpha 1	1291	3	40.8	67.7	154.2	104.2	105.1	162.7	119.1
17	ENG	endoglin	2022	3	43.6	379.2	307.7		1257.6	1853.4	1173.4	128.1	6825.9
18	KLHL22	kelch-like family member 22	84861	1	43.8	2286.4	2141.2	52	8129.3	957.6	7248.4	3937.8	8703.8
19	SLC27A3	solute carrier family 27 (fatty acid transporter)	member 3	11000	3	45.2	169.4	2677	9718.9	5828.9	6090	2968.6	
20	PXN	paxillin	5829	2	46	1231.2	606.3	276	1392.1	205.9	720.8	921.7	260
21	SORT1	sortilin 1	6272	2	46.3	41.1	157.9		589.9	8485.4	51.9	5990.8	
22	GNS	glucosamine (N-acetyl)-6-sulfatase	2799	3	49.6	215.7	527.4	675.6	787.3	521.1	1167	1429.8	723.6
23	MCL1	myeloid cell leukemia 1	4170	3	50.2	3440.9	9937.1	485.6	1846.4	8398.3	4802	2666	1277.3
24	SLC8B1	solute carrier family 8 (sodium/lithium/calcium exchanger)	member B1	80024	3	51.8	660	5062.9		1322.1	2809.2	2632	1908.5
25	TMEM259	transmembrane protein 259	91304	3	53.9	3504.5	3929.9		3578	4371.4	10239.3	1334.8	6713.3
26	ABR	active BCR-related	29	2	57.4	240.3	1398		2694.8	4570.4	1312	1438.2	12368.6
27	RHOB	ras homolog family member B	388	3	63.4	155.9	123.3		134.3	548.7	182.6	11162.1	440.1
28	GM2A	GM2 ganglioside activator	2760	3	63.5	236.5	4457.1	2962.4	892.9	197.4	1670.7		
29	TMBIM1	transmembrane BAX inhibitor motif containing 1	64114	3	65.3	18.7	103.7	2.6	97.1	121.6	165.6		362
30	CD63	CD63 molecule	967	3	66.7	48.1	433	34.9		205.9	425.5	83	
31	TPP1	tripeptidyl peptidase I	1200	3	66.8	109.7	1753.9	5382	1085.2	42.9	1192.7	441.4	2862.8

32	DUSP3	dual specificity phosphatase 3	1845	3	68.1	300.1	28.9	9039.1	293.7	36.2	1664.7	13948.1	1158.7
33	BCL2L13	BCL2-like 13 (apoptosis facilitator)	23786	1	68.4	3599.1	3536.6	1199.8	13681.8	16681.1	8830.8	2821.8	7278
34	NUCB1	nucleobindin 1	4924	3	70.8	51.2	1158.7		839.3	158.3	1928.2	201.2	
35	LAMB2	laminin	beta 2 (laminin S)	3913	3	70.8	7.1	43	697	135.7	33	1.7	8.5
36	MAX	MYC associated factor X	4149	1	72.5	5890	10467.2	901.2		10283.9	3185.7	4883.7	
37	COLGALT1	collagen beta(1-O)galactosyltransferase 1	79709	3	73	1494.1	4897.4		4224.3	205.8	6916.6	952.2	
38	MBD1	methyl-CpG binding domain protein 1	4152	1	73.7	5021.3	10941.9		9410	2903	2959.6	7962.9	
39	PBXIP1	pre-B-cell leukemia homeobox interacting protein 1	57326	3	73.8	219.9	91.3	87.3		5.7	217.5	502.8	
40	JDP2	Jun dimerization protein 2	122953	3	74.4	199.1	131.9		329.9	200.3	971.8	4111.4	3896.6
41	PACSIN2	protein kinase C and casein kinase substrate in neurons 2	11252	3	75	287.6	2429.8	120.8		1280.1	2096.5		2926.3
42	FLOT2	flotillin 2	2319	3	76.9	444	5129	823.5	652.2	89.8	711.1		4611.4
43	TNFRSF1A	tumor necrosis factor receptor superfamily	member 1A	7132	3	77.5	126.4	155.9		263.1	293.7	2798.4	55.9
44	TSPAN14	tetraspanin 14	81619	3	79.8	140.9	4203.5	7943	1111.9	5015.2	3711.6	12442.9	5806.1
45	LRP10	low density lipoprotein receptor-related protein 10	26020	3	79.9	42.5	334	15.3	189.2	184.5	1476.3	164.3	
46	SEC61A1	Sec61 alpha 1 subunit (S. cerevisiae)	29927	3	82.2	4232.2	2482.9	758.1	9244.8	2574.9	10493.4	1699	5320.1
47	100132388			100132388	0	83.3							
48	P4HB	prolyl 4-hydroxylase	beta polypeptide	5034	3	83.5	824.9	1440.8	536.6	4262	704.6	5834.4	1099.5
49	BCL2L2	BCL2-like 2	599	1	84	152.6	946.6		2081.6	1321.6	3315.6	9953.1	
50	TFE3	transcription factor binding to IGHM enhancer 3	7030	3	85	985.5	1324.4	327.3	5067.4	9936.7	5313	880	
51	RPS6KA2	ribosomal protein S6 kinase	90kDa	polypeptide 2	6196	3	85.8	141.5	246.1		989.1	2348.7	
52	NPC2	Niemann-Pick disease	type C2	10577	3	87.3	185.8	290.9	806.9	310.9	228.5	546.3	103.9
53	ASPH	aspartate beta-hydroxylase	444	3	87.8	681.4	799.5	2706.6	4591.4	3367	6253.1		1562.1
54	C1S	complement component 1	s subcomponent	716	3	88.7	168.3	167.9	1153.7		3561.5 1890.8	534.4	340.5
55	VAMP3	vesicle-associated membrane protein 3	9341	3	90.2	612.5	789.7		418.2	419.8	1515		495.4
56	MGLL	monoglyceride lipase	11343	3	91.2	135.3	526		1627.9	17.8	6747.7	562.2	4357.8
57	FLOT1	flotillin 1	10211	1	91.3		1465	147.2	221.5	123	1383.1	366.3	
58	ZMAT3	zinc finger	matrin-type 3	64393	3	92.9	979.9	7198.9	1304.8	6100.9	8853.8	7609.9	
59	KCTD5	potassium channel tetramerization domain containing 5	54442	1	93.2	5209	11117.8		9129	16918.1	9168.1	5532.6	6760.4
60	RRAS	related RAS viral (r-ras) oncogene homolog	6237	3	94	77.4	37.5	97.2	36.4	252.1	467.4	401.3	
61	CSRP1	cysteine and glycine-rich protein 1	1465	3	95.8	112.5	74.5		93.9	9.1	218.1	1241.8	543.8
62	ABTB1	ankyrin repeat and BTB (POZ) domain containing 1	80325	3	97.3	251.7	1258.7		3638.5	4990.7	5537.4	1914.2	6554
63	C10orf54	chromosome 10 open reading frame 54	64115	3	97.5	49.7	366.1		418.7	55.1	684.5		4010.3
64	RALB	v-ral simian leukemia viral oncogene homolog B	5899	3	98.2	364.8	2954.5	2403.2	203.1	513.3	996.9	149.1	2203.2
65	FHL1	four and a half LIM domains 1	2273	3	98.4	414.7	348.7	1183.5	903.7	1499.4	477.4	448.3	355.7
66	652968			652968	0	99	370.7	2352		3230.4	6338.7	367.8	588.2

67	VCL	vinculin	7414	3	102.1	187.3	885.7		517	377.3	1055.2		387.6
68	ADAM15	ADAM metallopeptidase domain 15	8751	2	102.2	1049	406.4	504.2	770	37.3	109.4	126.5	
69	S100A4	S100 calcium binding protein A4	6275	3	103	71.8	254.5	243.9	67.1	168.4	68.7	32	
70	WWTR1-AS1	WWTR1 antisense RNA 1	100128025	0	104.7		18409.8						
71	MFN2	mitofusin 2	9927	2	109.1	1548.7	5332.6		3441.3	1791.5	4230.8	9257	4150.9
72	ANO1	anoctamin 1	calcium activated chloride channel	55107	3	111.4	392.4	621.5	3988.9	1139.8	998.6	33.6	9205.3
73	S100A6	S100 calcium binding protein A6	6277	3	112	137.3	41	24.7	18.3	43.1	17.2	2.8	109.8
74	STX16	syntaxin 16	8675	2	113.2	6079.5	11924	4135.2	5507.1	5047.4	4404.1		1016.8
75	SNAP23	synaptosomal-associated protein	23kDa	8773	2	114.1	3998.4	9739.4		2294.5	6522.8	2615.3	4406.9
76	UNC93B1	unc-93 homolog B1 (C. elegans)	81622	3	114.9	1375.6	4908	2592	1114.4	389	939.1	5183.8	4842.4
77	IGFBP7	insulin-like growth factor binding protein 7	3490	3	118.1	176.3	44.7	45.5	553.1	1353.3	84.1	1585	173.2
78	CPQ	carboxypeptidase Q	10404	3	118.3	33.8	62.9	2337.1	810.7	259.8	1517.8	3105.6	1710.8
79	DUSP1	dual specificity phosphatase 1	1843	3	118.6	640.6	447.9	89.1	880.5	7342.8	2436.1	1185.5	824.7
80	POLDIP3	polymerase (DNA-directed)	delta interacting protein 3	84271	2	121.7	3469.1	6152.4		7023.2	10335.4	5494.8	5380.3
81	FAM219B	family with sequence similarity 219	member B	57184	3	128.8	2277.4	8419	1310.9	6217.9	2723.7	8383.2	941.3
82	ADD1	adducin 1 (alpha)	118	3	131.3	284.8	1360.6	1268.8	497.4	406.7	3212.8	102.6	2034.1
83	FKBP9	FK506 binding protein 9	63 kDa	11328	3	132.7	73.1	95.2	460.3	510	318.7	259.9	1174.3
84	ZFP36L2	ZFP36 ring finger protein-like 2	678	1	134	516.2	2139.6	732.3	3268.4	1098.8	833.6		
85	IKBKB	inhibitor of kappa light polypeptide gene enhancer in B-cells	kinase beta	3551	3	134.8	3801.7	15596.5	2079.2	5937.6	882.3	3858	6085.1
86	SRPR	signal recognition particle receptor (docking protein)	6734	2	135.5	4155	5502.1	325	4247.4	2196.9	7187.3	934.1	2144.9
87	TSPAN4	tetraspanin 4	7106	3	136.1	657.6	168.1		3859.8	1450.9	4941.7	25.8	4261.2
88	POMGNT1	protein O-linked mannose N-acetylglucosaminyltransferase 1 (beta 1)	2-)	55624	1	136.2	4931.7	2306.3	7955.4	7793.3	2428.8	4043.3	3931.1
89	SORBS3	sorbin and SH3 domain containing 3	10174	3	136.9	729.8	136.3		491	27	3959	7.2	
90	HSPG2	heparan sulfate proteoglycan 2	3339	3	140.1	35.1	188	331.2	958.5	507.8		11142.2	838.5
91	RHOA	ras homolog family member A	387	3	140.3	1047.5	2574.2		1302.2	589.4	1123.7	1142.5	473.6
92	APH1A	APH1A gamma secretase subunit	51107	2	143.2	2490.6	2711.1		2209.9	1150.6	4560.8		
93	EMP1	epithelial membrane protein 1	2012	3	143.2	71.4	42	474.9	71.5	616.1	313.8	245.3	35.7
94	CRIP2	cysteine-rich protein 2	1397	3	144.8	93.9	25.6					122.7	
95	FCGRT	Fc fragment of IgG	receptor	transporter	alpha	2217	3	146.8	76.9	22.4	29.9	92.6	486.7
96	CYBRD1	cytochrome b reductase 1	79901	3	147.4	49.5	224.4	1044.1	6206.8	7501	688.6	364.4	2900.7
97	RETSAT	retinol saturase (all-trans-retinol 13	14-reductase)	54884	3	147.6	358.9	1461.8		7704.2	502.8	4262.2	3206.9
98	PTGS1	prostaglandin-endoperoxide synthase 1 (prostaglandin G/H synthase and cyclooxygenase)	5742	3	147.8	121.3	635.1		525.1	382.3	2147.6	1660.8	4582.5
99	FKBP1A	FK506 binding protein 1A	12kDa	2280	3	148.5	2990.2	4047.6	4170.6	1899.7	1761.5	4279.7	
100	LPCAT2	lysophosphatidylcholine acyltransferase 2	54947	3	148.8	133.2	1117.3	1772	1213.8	8058.7		505.3	1091.2

Table S5. Highly co-expressed genes with GSTM3

A	Gene	Function	Entrez Gene ID	Supportability	Hsa MR for GSTM3	Hsa2 MR for GSTM3	Hsa3 MR for GSTM3	Mcc MR for GSTM3	Mmu MR for GSTM5	Mmu2 MR for GSTM5	Rno MR for GSTM5	Cfa MR for GSTM3	Dre MR for GSTM
0	GSTM3	glutathione S-transferase mu 3 (brain)	2947	2	0	0	0	0	0	0	0.0 0.0	0	0
1	GSTM2	glutathione S-transferase mu 2 (muscle)	2946	3	1.7	3.2	62.3		2421.8	1143.4	1558.8		
2	GSTM1	glutathione S-transferase mu 1	2944	3	2.5	3.9	252.4		525.6	10901.9	561.9		
3	GSTM4	glutathione S-transferase mu 4	2948	3	4.6	2	4245.9	8682.9	4209.5	2504.3	4264.2	1.4	
4	AMIGO1	adhesion molecule with Ig-like domain 1	57463	2	7.9	5188.9	2830.8		12095.9	6149.5	5243.3	14258	
5	GSTM5	glutathione S-transferase mu 5	2949	3	8.2	21.1	672.4		382.5	2671.1	532.1		
6	HLF	hepatic leukemia factor	3131	3	11.8	3914.5	818.9		3725.9	5697.2		4787.1	
7	REEP1	receptor accessory protein 1	65055	3	15.9	699.1	1676.9		2613.1	11315.4	1394.8	10365	
8	KGFLP2	keratinocyte growth factor-like protein 2	654466	3	21.1	3937	3271.7						
9	MAPT	microtubule-associated protein tau	4137	3	24.5	3208.7	254.9		7679.5	16691	5070	6149.4	
10	286440			286440	0	29.7							
11	EFHD1	EF-hand domain family	member D1	80303	3	43.6	1267	563.2		1152.5	3953.5	1676.5	15859.2
12	C3orf18	chromosome 3 open reading frame 18	51161	3	43.6	8971.6	8596.8	7103	11230.5	11300.3	10605.3	10566.6	
13	NGFRAP1	nerve growth factor receptor (TNFRSF16) associated protein 1	27018	3	47.8	111.2	4011.5		175.5	1419.2	35.7		
14	ZNF540	zinc finger protein 540	163255	3	50.9	4770.4	826.5						
15	C2orf40	chromosome 2 open reading frame 40	84417	3	55.3	7585.8	6205.4	3115.4	3491.3	5702.8	1476.3	3555.1	2176.7
16	MAGED2	melanoma antigen family D	2	10916	3	61.2	186	6227.4	3364.2	13005.9	1790.6	246.2	314.1
17	8-Sep	septin 8	23176	2	64.8	1800.1	4398.5	9889.3	13.2	12215.6	980.4	1231.5	3382.1
18	LMOD1	leiomodin 1 (smooth muscle)	25802	3	65.8	1569.2	1813.8	7429.3	8865.4	12803.2	8323.9	9897.3	
19	SYNGR1	synaptogyrin 1	9145	1	67.3	704.5	4101.7		3938.8	15801.9	3947.7	6905.9	5129.4
20	PHYHD1	phytanoyl-CoA dioxygenase domain containing 1	254295	3	68.9	5491	294.7	976.9		6694.7	11470	860.5	1082.4
21	143381			143381	0	74.6							
22	HSPA2	heat shock 70kDa protein 2	3306	3	80.3	145.4	3970		703.3	402.4	2258.8	648.5	
23	CTSF	cathepsin F	8722	3	81.4	543.7	488.6		23.9	1070	1352.6	1695.2	4602.7
24	PGR	progesterone receptor	5241	3	82	276.6	78.8	9567.5	14116	11191	9716.1	2515.8	
25	TCEAL3	transcription elongation factor A (SII)-like 3	85012	3	82.2	6876.2	1721.4						
26	WDR5B	WD repeat domain 5B	54554	3	83.4	3741.3	1407.3	130.3	6964.4	960.5	2314.6		
27	RAI2	retinoic acid induced 2	10742	3	93	12912.4	1209	7117.1	3977.3	3860.5			
28	C1QTNF7	C1q and tumor necrosis factor related protein 7	114905	3	93.2	4599.2	300.5	4000.6	5463.8	11529.5	3075.8	2942.1	
29	WDFY3-AS2	WDFY3 antisense RNA 2	404201	2	94.3	10426.9	739.9						
30	FAM189A2	family with sequence similarity 189	member A2	9413	3	95.5	11069.5	2813.5	10111.5	10967.1	3693.9	6667.7	1573.8

31	PLCD4	phospholipase C	delta 4	84812	2	95.9	6707.8	5073.6	1821.6	6979.5	4560.5	1131.8	11649.5
32	LOC284023	uncharacterized LOC284023	284023	1	98	6459.9	906.1						
33	FXYD1	FXYD domain containing ion transport regulator 1	5348	3	103.5	7460.4	4753.9		2416.4	1253.2	3753.1	2761.6	
34	GARNL3	GTPase activating Rap/RanGAP domain-like 3	84253	1	105.5	2375.9	757		4595.3	1884.4	7255.3	2579.2	
35	MINOS1	mitochondrial inner membrane organizing system 1	440574	3	105.6	3855.2	2374.2		432.9	2331.1	1249.2	7940	1145.6
36	CBX7	chromobox homolog 7	23492	3	108.5	7001.3	9213	4338.7	17012.3	18427.9	8763.3	13112.7	
37	PXMP4	peroxisomal membrane protein 4	24kDa	11264	2	115.2	2055.3	511.4		3503.7	14954.9	8696.9	1953.6
38	SCN4B	sodium channel	voltage-gated	type IV	beta subunit	6330	3	115.5	10244.3	9881.4		8401.8	4866.5
39	NOVA1	neuro-oncological ventral antigen 1	4857	3	121.5	2168.3	1827.3	4999.2	3134.6	7205.8		828.5	8473.5
40	MEIS3P1	Meis homeobox 3 pseudogene 1	4213	3	124.8	1969.9	3229.3						
41	MYH11	myosin	heavy chain 11	smooth muscle	4629	3	124.9	1324.2	2486.8	2411.4	7910.4	5921.9	7500.2
42	DSTN	destrin (actin depolymerizing factor)	11034	3	125.4	673.3	4511		771	5202.4		173.8	
43	MAN1C1	mannosidase	alpha	class 1C	member 1	57134	3	125.5	3568.5	6426.9	5972.6	7738.1	5678.5
44	PTGR1	prostaglandin reductase 1	22949	3	125.5	671.5	3612.7		2368.1	11682.5	2969	1587.5	159
45	ADHFE1	alcohol dehydrogenase	iron containing	1	137872	3	126.3	2667.3	1854.4	6086.6	6033.9	5300.8	12169.1
46	SEMA3G	sema domain	immunoglobulin domain (Ig)	short basic domain	secreted	(semaphorin) 3G	56920	3	126.3	12241.1	3007.6		8174.2
47	SCUBE2	signal peptide	CUB domain	EGF-like 2	57758	3	127	495.2	686.6		11251.6	14885.3	
48	C14orf132	chromosome 14 open reading frame 132	56967	3	128.2	4796.3	565						
49	RNF180	ring finger protein 180	285671	3	131	793	1615.7	6136.2	3375.4	1086.1	2156.4	691.3	3181.7
50	GPRASP1	G protein-coupled receptor associated sorting protein 1	9737	3	134.3	459.7	2195.8	5295.3		4037.5	2295.9	1567.6	
51	SLC2A10	solute carrier family 2 (facilitated glucose transporter)	member 10	81031	3	137.8	2582.3	584	10079.2	3892	7360.5		7894.9
52	DNALI1	dynein	axonemal	light intermediate chain 1	7802	3	137.9	2417.4	536.5		8932.5	2947.4	10001.4
53	LRP2	low density lipoprotein receptor-related protein 2	4036	2	138.2	6995.1	2972	2574.7	11139.9	15960.2	10543.7	2686	
54	RERG	RAS-like	estrogen-regulated	growth inhibitor	85004	3	143.5	453.8	491	11554.7	3002.8	1665.7	4512.1
55	730057			730057	0	151.2							
56	CRY2	cryptochrome circadian clock 2	1408	3	158.9	6503.8	3759.5	977.7		11847.9	8471.4	8680.6	7447.9
57	GDF10	growth differentiation factor 10	2662	3	159.6	11769.5	5082.4		2458.2	12039.8	2475.6	13815.5	
58	AGTR1	angiotensin II receptor	type 1	185	3	161.6	2863	1000.4	2956.9	1087.6	341.2	6969.5	1797.6
59	PAMR1	peptidase domain containing associated with muscle regeneration 1	25891	3	163.9	4270.5	1964.6		3029.5	1844.7		6733.2	
60	PRRT1	proline-rich transmembrane protein 1	80863	3	165.9		7120.2	8591.6				3937.3	
61	POMGNT2	protein O-linked mannose N-acetylglucosaminyltransferase 2 (beta 1	4-)	84892	2	166.8	2677.7	7817.3	10623.8	2142.6	2383.3	3204.4	112.2

62	CMYA5	cardiomyopathy associated 5	202333	3	168	1275.7	876	1692.1				10974.9	
63	FAM213A	family with sequence similarity 213	member A	84293	3	168.7	208.5	1057.7		25	342.6	420.1	3803.9
64	SHE	Src homology 2 domain containing E	126669	3	171.3	10740.6	1159.1		9488.8	18435.8	11172.6	4330.2	
65	INMT	indolethylamine N-methyltransferase	11185	3	175.2	8151.8	1255.3		12615.4	11623.3	11886.3		4899
66	PRELP	proline/arginine-rich end leucine-rich repeat protein	5549	3	181.2	2381.5	993.7		2735.3	1058.2	2956.2	9850	
67	SALL2	spalt-like transcription factor 2	6297	3	184.7	8655	6733.9	9414.4	2925.2	5831.9	2237.6		
68	ZFP2	ZFP2 zinc finger protein	80108	3	186	6208.7	1622.2	6184.4	5717.3	10431.8			
69	FAM127A	family with sequence similarity 127	member A	8933	3	187.3	215.5	7287.5	1243.2	492.4	504.9		
70	TCEAL2	transcription elongation factor A (SII)-like 2	140597	3	188.1	1936.7	4454.7	7064.9					
71	LRRN4CL	LRRN4 C-terminal like	221091	3	194.6	7016.3	451.2		7371.3	18284.5	9928.1		
72	PLEKHA6	pleckstrin homology domain containing	family A member 6	22874	3	195.4	8693.5	852					6928.3
73	ANXA11	annexin A11	311	3	195.6	12379.7	16750			18245.4	8815.6	4675.4	2802.4 396.4
74	KLHDC8B	kelch domain containing 8B	200942	3	206.8	548	7759.5	6535.3	2635	9430.8	3147.7	5911.7	
75	MIR143HG	MIR143 host gene (non-protein coding)	728264	1	209.1		215.8						
76	CLSTN2	calsyntenin 2	64084	3	213.4	2780.1	458.1		9903.4	11289.2	8617.7	10780.1	
77	DYNLRB2	dynein	light chain	roadblock-type 2	83657	3	214.2	7402.7		2486.5	4833.2	1314.8	5529.9
78	KLHDC1	kelch domain containing 1	122773	3	218.2	479.1	5153.3	5109.5	5366.6	410.6	7284.2	4074.6	
79	COX7A1	cytochrome c oxidase subunit VIIa polypeptide 1 (muscle)	1346	3	219	3804.4	2234.2	6460.5	3156.3	16316.7		1684.9	
80	ASPA	aspartoacylase	443	3	220.8	942.1	2017	2350.7	1934.7	3490.8	5292.1	5495.2	
81	CAP2	CAP	adenylate cyclase-associated protein	2 (yeast)	10486	3	223.4	152.1	950.9		1369	1106.7	3839.8
82	ANGPTL1	angiopoietin-like 1	9068	3	224.7	1867.7	1009.3		6379.6	15210.4		11986.2	
83	ZSWIM5	zinc finger	SWIM-type containing 5	57643	3	226.9	1790.5	1687.5	3072.9	10797.5	5644.8	7890.2	
84	HSPB6	heat shock protein	alpha-crystallin-related	B6	126393	3	227.2	3846.2	1965.3	1961.2	578.5	2716	3806.4
85	TCF21	transcription factor 21	6943	3	227.5	3821.9	1451.8	10864.3	8803.8	13973	6441.8	2507.5	
86	C16orf89	chromosome 16 open reading frame 89	146556	3	228	13549.8	1527.5	4571.7	14624.2	15430.4	8683.9	3668.9	
87	JAM2	junctional adhesion molecule 2	58494	3	228.6	2443	1616.3		5279.7	16683	10881	2687	
88	PLCXD3	phosphatidylinositol-specific phospholipase C	X domain containing 3	345557	3	229.1	4374.7	852.3		7319.9	3185.9	2606.7	1444.6
89	OGN	osteoglycin	4969	3	229.5	2767.8	1340.8	2565	1560.2	3133.6	2048.6	5431	
90	MAOA	monoamine oxidase A	4128	3	232.4	3622.8	1914.5		793.9	9502.3	4291.5	1663.8	
91	FAM229B	family with sequence similarity 229	member B	619208	3	235.7	324.8	286.5		68.3	1.4	1029.2	
92	ZBTB16	zinc finger and BTB domain containing 16	7704	3	242.5	8596.8	4189.1	1946.1	10409.1	8505.3		8894.1	6719.9
93	TMEM161BP1	transmembrane protein 161B pseudogene 1	646360	0	245.7								
94	CACNA1D	calcium channel	voltage-dependent	L type	alpha 1D subunit	776	3	248.3	2556.5	1398	6341.1	17139.3	2653.1

95	APOD	apolipoprotein D	347	3	250.2	2184.1	855.4		2579.1	6202.5	2402.9	6906.6	6986.7
96	TLE2	transducin-like enhancer of split 2	7089	3	251.4	7110.3	2407.9		5119.4	15966.4	9343.8		
97	285535			285535	0	253.4							
98	PDE8B	phosphodiesterase 8B	8622	3	255.7	242.8	636.3		11238.2	3363.4	10270.8	1761	
99	NR3C2	nuclear receptor subfamily 3	group C	member 2	4306	3	256	3885.6	1197.4		5812.1	10329.8	5788.9
100	ADIRF	adipogenesis regulatory factor	10974	3	259.5	7974.8	2250.3						

Table S6. Functional annotation and highly co-expressed genes with DEGs (GSTM3, EFEMP1, FBLN1, GSN and FGL2) during the lactation

Genes	Functional annotation (biological process)		Genes	Functional annotation (biological process)		Genes	Functional annotation (biological process)		Genes	Functional annotation (biological process)	
GSTM3 (Glutathione S-transferase mu 3)	GO:0008065	establishment of blood-nerve barrier	*EFEMP1* (EGF containing fibulin-like extracellular matrix protein 1)	GO:0032331	negative regulation of chondrocyte differentiation	FBLN1 (Fibulin 1)	GO:0007566	embryo implantation	GSN (Gelsolin)	GO:0051014	actin filament severing
	GO:0018916	nitrobenzene metabolic process		GO:0018108	peptidyl-tyrosine phosphorylation		GO:0030198	extracellular matrix organization		GO:0051016	barbed-end actin filament capping
	GO:0070458	cellular detoxification of nitrogen compound		GO:0007173	epidermal growth factor receptor signaling pathway		GO:0016032	viral reproduction		GO:0051593	response to folic acid
	GO:0042178	xenobiotic catabolic process		GO:0007601	visual perception					GO:0071276	cellular response to cadmium ion
	GO:0006749	glutathione metabolic process		GO:0030198	extracellular matrix organization					GO:0030041	actin filament polymerization

Table S7. The lists of genes directly connected with DEGs (GSTM3, EFEMP1, GSN, FGL2 and FBLN1) on the co-expression network

Genes directly connected with GSTM3 on the Co-expression network			
Symbol	Function	MR (Mutual Rank) with PDX-1	Co-expression detail for PDX1 association
GSTM2	glutathione S-transferase mu 2 (muscle)	1.7	GEO experiment ID: GSE2109, GSE6532, GSE6791, GSE3744, GSE5787, GSE6791
GSTM1	glutathione S-transferase mu 1	2.5	GEO experiment ID: GSE2109, GSE6532, GSE3744, GSE6791, GSE5816, GSE5787
GSTM4	glutathione S-transferase mu 4	4.6	
AMIGO1	adhesion molecule with Ig-like domain 1	7.9	GEO experiment ID: GSE2109, GSE6532, GSE5350, GSE2817,
GSTM5	glutathione S-transferase mu 5	8.2	GEO experiment ID: GSE3744, GSE2109, GSE4780, GSE3325, GSE6281, GSE5675, GSE5764,
KGFLP2	keratinocyte growth factor-like protein 2	21.1	GEO experiment ID: GSE7153, GSE5281, GSE2109, GSE5350, GSE2817, GSE3325
Genes directly connected with EFEMP1 on the Co-expression network			
Symbol	Function	MR (Mutual Rank) with EFEMP1	Co-expression detail for EFEMP1 association
ABI3BP	ABI family, member 3 (NESH) binding protein	5.9	GEO experiment ID: GSE7153
CCDC80	coiled-coil domain containing 80	6.9	GEO experiment ID: GSE7153, GSE6890
C1R	complement component 1, r subcomponent	8.2	GEO experiment ID: GSE7153, GSE7127, GSE2109
Genes directly connected with GSN on the Co-expression network			
Symbol	Function	MR (Mutual Rank) with GSN	Co-expression detail for GSN association
CYB5R3	cytochrome b5 reductase 3	6.9	GEO experiment ID: GSE7127, GSE3526, GSE2109, GSE7509, GSE4780
NDRG2	NDRG family member 2	9.3	GEO experiment ID: GSE6863, GSE2109, GSE5281, GSE5764, GSE5350, GSE6573
EPAS1	endothelial PAS domain protein 1	14.5	GEO experiment ID: GSE3526, GSE4780, GSE2109, GSE5486, GSE7127
CPNE2	copine II	16.6	GEO experiment ID: GSE2842, GSE2677, GSE2109
STOM	stomatin	17.3	GEO experiment ID: GSE2109, GSE2842, GSE2842,
Genes directly connected with FGL2 on the Co-expression network			
Symbol	Function	MR (Mutual Rank) with FGL2	Co-expression detail for FGL2 association
MPEG1	macrophage expressed 1	2.0	GEO experiment ID: GSE2842, GSE5350, GSE6357, GSE4780, GSE7509, GSE6338,
TLR8	toll-like receptor 8	6.0	GEO experiment ID: GSE2842, GSE6338, GSE2109, GSE6357, GSE5764, GSE5350, GSE6791, GSE3077
MS4A6A	membrane-spanning 4-domains, subfamily A, member 6A	6.9	GEO experiment ID: GSE2842, GSE7509, GSE6357, GSE4780, GSE6338, GSE5787, GSE5350, GSE2109
CX3CR1	chemokine (C-X3-C motif) receptor 1	7.5	GEO experiment ID: GSE2842, GSE4780
P2RY14	purinergic receptor P2Y, G-protein coupled, 14	28.5	GEO experiment ID: GSE2109, GSE3526, GSE5350, GSE2842, GSE6338,
Genes directly connected with FBLN1 on the Co-expression network			
Symbol	Function	MR (Mutual Rank) with FBLN1	Co-expression detail for FBLN1 association
DCN	decorin	2.5	GEO experiment ID: GSE3077
MFAP4	microfibrillar-associated protein 4	3.2	GEO experiment ID: GSE6532, GSE3526, GSE2109, GSE7392
COL14A1	collagen, type XIV, alpha 1	4.9	GEO experiment ID: GSE3526, GSE2109, GSE7392,
FBLN2	fibulin 2	6.8	GEO experiment ID: GSE7392, GSE2109, GSE3526