

Lipocalin 2/Neutrophil gelatinase associated lipocalin mediates the apoptotic effect of 13-*cis* retinoic acid in human skin and SEB-1 sebocytes

Amanda M. Nelson<sup>1,3</sup>, Wei Zhao<sup>2</sup>, Kathryn L. Gilliland<sup>1,3</sup>, Andrea Zaenglein<sup>3</sup>, WenLei Liu<sup>2</sup>, and Diane M. Thiboutot<sup>1,3</sup>.

The Jake Gittlen Cancer Research Foundation<sup>1</sup>, Department of Health Evaluation Sciences<sup>2</sup>, and Department of Dermatology<sup>3</sup>, The Pennsylvania State University College of Medicine, Hershey PA

**Complete list: Significantly Changed genes in SEB-1 sebocytes after 72 hrs 13-*cis* RA**

Probe ID	Accession #	Fold Δ	Gene Title	Symbol
1042_at	U27185	12.25	retinoic acid receptor responder (tazarotene induced) 1	RARRES1
33505_at	AI887421	9.89	retinoic acid receptor responder (tazarotene induced) 1	RARRES1
32821_at	AI762213	7.04	lipocalin 2 (oncogene 24p3)	LCN2
38631_at	M92357	5.95	tumor necrosis factor, alpha-induced protein 2	TNFAIP2
32570_at	L76465	5.91	hydroxyprostaglandin dehydrogenase 15-(NAD)	HPGD
36105_at	M18728	4.98	carcinoembryonic antigen-related cell adhesion molecule 6 (non-specific cross reacting antigen)	CEACAM6
40071_at	U03688	4.64	cytochrome P450, family 1, subfamily B, polypeptide 1	CYP1B1
859_at	U03688	4.30	cytochrome P450, family 1, subfamily B, polypeptide 1	CYP1B1
37322_s_at	X82460	4.25	hydroxyprostaglandin dehydrogenase 15-(NAD)	HPGD
1715_at	U37518	4.18	tumor necrosis factor (ligand) superfamily, member 10	TNFSF10
1343_s_at	S66896	3.70	serine (or cysteine) proteinase inhibitor, clade B (ovalbumin), member 3	SERPINB3
873_at	M26679	3.65	homeo box A5	HOXA5
988_at	X16354	3.52	carcinoembryonic antigen-related cell adhesion molecule 1 (biliary glycoprotein)	CEACAM1
1586_at	M35878	3.43	insulin-like growth factor binding protein 3	IGFBP3
36686_at	U07919	3.29	aldehyde dehydrogenase 1 family, member A3	ALDH1A3
33236_at	AF060228	3.22	retinoic acid receptor responder (tazarotene induced) 3	RARRES3
37233_at	AF079167	3.08	oxidised low density lipoprotein (lectin-like) receptor 1	OLR1
36609_at	D26443	3.06	solute carrier family 1 (glial high affinity glutamate transporter), member 3	SLC1A3
1890_at	AB000584	3.00	growth differentiation factor 15	GDF15
33131_at	X70683	2.98	SRY (sex determining region Y)-box 4	SOX4
35064_at	X81006	2.74	tripartite motif-containing 31	TRIM31
2031_s_at	U03106	2.60	cyclin-dependent kinase inhibitor 1A (p21, Cip1)	CDKN1A
40445_at	AF017307	2.51	E74-like factor 3 (ets domain transcription factor, epithelial-specific )	ELF3
37821_at	AF041260	2.48	breast carcinoma amplified sequence 1	BCAS1
37533_r_at	D86980	2.46	tetratricopeptide repeat domain 9	TTC9
669_s_at	L05072	2.42	interferon regulatory factor 1	IRF1
38584_at	AF026939	2.42	interferon-induced protein with tetratricopeptide repeats 3	IFIT3
35029_at	Y07828	2.35	tripartite motif-containing 31	TRIM31
41814_at	M29877	2.29	fucosidase, alpha-L- 1, tissue	FUCA1
909_g_at	M14660	2.23	interferon-induced protein with tetratricopeptide repeats 2	IFIT2
36634_at	U72649	2.20	BTG family, member 2	BTG2
908_at	M14660	2.20	interferon-induced protein with tetratricopeptide repeats 2	IFIT2
1582_at	M29540	2.18	carcinoembryonic antigen-related cell adhesion molecule 5	CEACAM5
384_at	X71874	2.09	proteasome (prosome, macropain) subunit, beta type, 10	PSMB10
41433_at	M73255	2.08	vascular cell adhesion molecule 1	VCAM1
39669_at	AJ009985	2.07	annexin A9	ANXA9
38389_at	X04371	2.07	2',5'-oligoadenylate synthetase 1, 40/46kDa	OAS1
1882_g_at	G4058-HT432	2.06	---	---
33559_at	U61412	1.94	PTK6 protein tyrosine kinase 6	PTK6

Probe ID	Accession #	Fold $\Delta$	Gene Title	Symbol
40511_at	X58072	1.85	GATA binding protein 3	GATA3
38388_at	M11810	1.82	2',5'-oligoadenylate synthetase 1, 40/46kDa	OAS1
38042_at	X03674	1.79	protein kinase C, alpha	PRKCA
902_at	L41939	1.78	EPH receptor B2	EPHB2
34162_at	D84111	1.78	RNA binding protein with multiple splicing	RBPMS
38269_at	AL050147	1.77	protein kinase D2	PRKD2
38242_at	AF068180	1.76	B-cell linker	BLNK
37383_f_at	X58536	1.71	major histocompatibility complex, class I, B /// major histocompatibility complex, class I, C	HLA-B /// HLA-C
39665_at	U33267	1.71	glycine receptor, beta	GLRB
881_at	M35198	1.71	integrin, beta 6	ITGB6
544_at	S76638	1.70	nuclear factor of kappa light polypeptide gene enhancer in B-cells 2 (p49/p100)	NFKB2
37643_at	X63717	1.69	Fas (TNF receptor superfamily, member 6)	FAS
33267_at	AF035315	1.66	ATPase, aminophospholipid transporter (APLT), Class I, type 8A, member 1	ATP8A1
1562_g_at	U27193	1.66	dual specificity phosphatase 8	DUSP8
37451_at	AL109695	1.62	solute carrier organic anion transporter family, member 3A1	SLCO3A1
35194_at	X53463	1.60	glutathione peroxidase 2 (gastrointestinal)	GPX2
34213_at	AB020676	1.59	KIBRA protein	KIBRA
40898_at	U46751	1.56	sequestosome 1	SQSTM1
322_at	D88532	1.47	phosphoinositide-3-kinase, regulatory subunit 3 (p55, gamma)	PIK3R3
39015_f_at	L42611	-4.76	keratin 6A /// keratin 6C	KRT6A KRT6C
34721_at	U42031	-4.00	FK506 binding protein 5	FKBP5
39016_r_at	L42611	-3.85	keratin 6A /// keratin 6C	KRT6A KRT6C
33821_at	AL034374	-3.23	ELOVL family member 5, elongation of long chain fatty acids (FEN1/Elo2, SUR4/Elo3-like, yeast)	ELOVL5
1610_s_at	J00139	-3.12	dihydrofolate reductase	DHFR
32005_at	M57703	-2.78	pro-melanin-concentrating hormone	PMCH
39681_at	AF060568	-2.70	zinc finger and BTB domain containing 16	ZBTB16
36739_at	U54617	-2.56	pyruvate dehydrogenase kinase, isoenzyme 4	PDK4
31691_g_at	U08997	-2.50	glutamate dehydrogenase 1	GLUD1
36922_at	X59618	-2.27	ribonucleotide reductase M2 polypeptide	RRM2
32251_at	AA149307	-2.27	transcription elongation factor A (SII)-like 4	TCEAL4
36270_at	U04343	-2.13	CD86 antigen (CD28 antigen ligand 2, B7-2 antigen)	CD86
39677_at	D80008	-2.04	DNA replication complex GINS protein PSF1	PSF1
40137_at	M31724	-2.04	protein tyrosine phosphatase, non-receptor type 1	PTPN1
34944_at	U51704	-2.04	---	---
39153_r_at	U06632	-1.96	coilin	COIL
779_at	D21337	-1.92	collagen, type IV, alpha 6	COL4A6
37062_at	S62907	-1.92	gamma-aminobutyric acid (GABA) A receptor, alpha 2	GABRA2
32283_at	AI239869	-1.89	Iduronate 2-sulfatase	MPS2
39338_at	AI201310	-1.82	S100 calcium binding protein A10 (annexin II ligand, calpactin I, light polypeptide (p11))	S100A10
115_at	X14787	-1.79	thrombospondin 1	THBS1
36104_at	AA526497	-1.79	ubiquinol-cytochrome c reductase hinge protein	UQCRH
35938_at	M72393	-1.79	phospholipase A2, group IVA (cytosolic, calcium-dependent)	PLA2G4A
35342_at	AF052159	-1.72	protein tyrosine phosphatase-like (proline instead of catalytic arginine), member b	PTPLB
1536_at	U77949	-1.64	CDC6 cell division cycle 6 homolog (S. cerevisiae)	CDC6
41547_at	AF047472	-1.59	BUB3 budding uninhibited by benzimidazoles 3 homolog (yeast)	BUB3
41529_g_at	W72239	-1.49	hypothetical protein LOC130074	LOC130074

Lipocalin 2/Neutrophil gelatinase associated lipocalin mediates the apoptotic effect of 13-*cis* retinoic acid in human skin and SEB-1 sebocytes

Amanda M. Nelson<sup>1,3</sup>, Wei Zhao<sup>2</sup>, Kathryn L. Gilliland<sup>1,3</sup>, Andrea Zaenglein<sup>3</sup>, WenLei Liu<sup>2</sup>, and Diane M. Thiboutot<sup>1,3</sup>.

The Jake Gittlen Cancer Research Foundation<sup>1</sup>, Department of Health Evaluation Sciences<sup>2</sup>, and Department of Dermatology<sup>3</sup>, The Pennsylvania State University College of Medicine, Hershey PA

**Complete list: Significantly Changed genes after one-week Isotretinoin treatment.**

Probe ID	Accession #	Fold $\Delta$	Gene Title	Symbol
212531_at	NM_005564	7.03	lipocalin 2 (oncogene 24p3)	LCN2
205916_at	NM_002963	6.20	S100 calcium binding protein A7 (psoriasin 1)	S100A7
203535_at	NM_002965	4.53	S100 calcium binding protein A9 (calgranulin B)	S100A9
219874_at	NM_024628	3.78	solute carrier family 12 (K/Cl transporters)	SLC12A8
206754_s_at	NM_000767	3.32	cytochrome P450, family 2, subfamily B	CYP2B7P1
202376_at	NM_001085	2.61	serine (or cysteine) proteinase inhibitor	SERPINA3
206392_s_at	NM_002888	2.61	retinoic acid receptor responder (TIG 1)	RARRES1
221872_at	AI669229	2.45	retinoic acid receptor responder (TIG 1)	RARRES1
206391_at	NM_002888	2.42	retinoic acid receptor responder (TIG 1)	RARRES1
218960_at	NM_016425	2.35	transmembrane protease, serine 4	TMPRSS4
206478_at	NM_014792	2.27	KIAA0125	KIAA0125
219014_at	NM_016619	2.21	placenta-specific 8	PLAC8
219554_at	NM_016321	2.08	Rhesus blood group, C glycoprotein	RHCG
221605_s_at	AF136970	2.04	pipecolic acid oxidase	PIPOX
204351_at	NM_005980	1.99	S100 calcium binding protein P	S100P
218498_s_at	NM_014584	1.96	ERO1-like (S. cerevisiae)	ERO1L
207367_at	NM_001676	1.92	ATPase, H <sup>+</sup> /K <sup>+</sup> transporting, nongastric, alpha	ATP12A
216598_s_at	S69738	1.91	chemokine (C-C motif) ligand 2	CCL2
203423_at	NM_002899	1.81	retinol binding protein 1, cellular	RBP1
219795_at	NM_007231	1.69	solute carrier family 6 (amino acid transporter)	SLC6A14
210827_s_at	U73844	1.67	E74-like factor 3 (ets domain transcription factor)	ELF3
221701_s_at	AF352728	1.62	stimulated by retinoic acid gene 6 homolog	STRA6
204541_at	NM_012429	1.57	SEC14-like 2 (S. cerevisiae)	SEC14L2
202575_at	NM_001878	1.56	cellular retinoic acid binding protein 2	CRABP2
210397_at	U73945	1.52	defensin, beta 1	DEFB1
205428_s_at	NM_001740	1.51	calbindin 2, 29kDa (calretinin)	CALB2
204268_at	NM_005978	1.50	S100 calcium binding protein A2	S100A2
214088_s_at	AW080549	1.49	fucosyltransferase 3	FUT3
214599_at	NM_005547	1.49	involucrin	IVL
205926_at	NM_004843	1.49	interleukin 27 receptor, alpha	IL27RA
219578_s_at	AF329403	1.48	cytoplasmic polyadenylation element BP 1	CPEB1
216379_x_at	AK000168	1.43	CD24 antigen	CD24
221577_x_at	BC000529	1.41	growth differentiation factor 15	GDF15
213316_at	AL050154	1.40	KIAA1462	KIAA1462
205185_at	NM_006846	1.39	serine protease inhibitor, Kazal type 5	SPINK5
219956_at	NM_007210	1.38	UDP-N-acetyl-alpha-D-galactosamine	GALNT6

<b>Probe ID</b>	<b>Accession #</b>	<b>Fold <math>\Delta</math></b>	<b>Gene Title</b>	<b>Symbol</b>
212715_s_at	AB020626	1.27	microtubule associated monooxygenase	MICAL3
218963_s_at	NM_015515	1.26	keratin 23 (histone deacetylase inducible)	KRT23
206143_at	NM_000111	-2.29	solute carrier family 26, member 3	SLC26A3
206214_at	NM_005084	-2.27	phospholipase A2, group VII (PAF acetylhydrolase)	PLA2G7
206623_at	NM_000440	-2.13	phosphodiesterase 6A, cGMP-specific, rod, alpha	PDE6A
206100_at	NM_001874	-1.55	carboxypeptidase M	CPM
207030_s_at	NM_001321	-1.50	cysteine and glycine-rich protein 2	CSRP2