

**TableS1:** The fold change, between E13.5 *E8.5-Derm<sup>Ezh2</sup>* and controls, in the expression of target genes of various signaling pathways known to regulate epidermal and dermal differentiation

Expression of various genes in E13.5 whole skin						
Function	Gene Name	Fold Change in E8.5-Derm <sup>Ezh2</sup> (with respect to controls)	p-value	No. of embryos / condition	Significance	probe_ID
Wnt signaling targets	Wnt5a	0.60	0.38	3	Not Significant	Mm00437347_m1
	cMyc	0.76	0.52	3	Not Significant	Mm00487804_m1
	Lrig1	0.81	0.13	3	Not Significant	Mm00456116_m1
	Axin2	1.14	<b>0.01</b>	3	<b>Significant</b>	Mm00443610_m1
	Lef1	1.49	<b>0.02</b>	3	<b>Significant</b>	Mm00550265_m1
RA signaling targets	Hbegf	0.49	0.15	3	Not Significant	Mm00439306_m1
	RAR $\gamma$	0.92	0.58	6	Not Significant	Mm00441091_m1
	ROR2	0.77	0.16	6	Not Significant	Mm00443470_m1
	Aldh1a2	1.18	0.60	6	Not Significant	Mm00501306_m1
	Cyp26b1	1.53	0.24	6	Not Significant	Mm00558507_m1
	Stra6	0.67	<b>0.03</b>	6	<b>Significant</b>	Mm00486457_m1
	Crabp2	0.68	<b>0.04</b>	6	<b>Significant</b>	Mm00801693_g1
p63 targets	Klf4	0.57	0.42	3	Not Significant	Mm00516104_m1
	K14	1.12	0.33	3	Not Significant	Mm00516876_m1
HH signaling targets	Snai1	0.95	0.91	3	Not Significant	Mm00441533_g1
	Pthrp	1.09	0.90	3	Not Significant	Mm00436057_m1
	Gli1	1.27	0.68	3	Not Significant	Mm00494654_m1

**TableS2:** The fold change, between *E8.5-Derm<sup>Ezh2</sup>* and controls, in the expression of retinoic acid signaling target genes in E10.5 flow sorted cells

Gene Name	Fold Change in E8.5-Derm <sup>Ezh2</sup> (with respect to controls)	p-value	Significance	probe_ID	Cell fraction
Crabp2	0.97	0.80	Not Significant	Mm00801693_g1	PDGFR $\alpha$ <sup>+</sup> cells
Stra6	0.96	0.84	Not Significant	Mm00486457_m1	
Hbegf	1.10	0.52	Not Significant	Mm00558507_m1	
Cyp26b1	0.39	0.31	Not Significant	Mm00439306_m1	
Raldh2	1.26	0.45	Not Significant	Mm00501306_m1	
RAR $\gamma$	1.03	0.89	Not Significant	Mm00441091_m1	
ROR2	1.24	0.52	Not Significant	Mm00443470m1	
Hbegf	0.81	0.43	Not Significant	Mm00558507_m1	PDGFR $\alpha$ <sup>-</sup> cells
Raldh2	1.36	0.32	Not Significant	Mm00501306_m1	
RAR $\gamma$	0.89	0.80	Not Significant	Mm00441091_m1	
Cyp26b1	0.60	0.54	Not Significant	Mm00439306_m1	
Stra6	0.91	0.69	Not Significant	Mm00486457_m1	