

**Table S3. Gene sets significantly overlapped with RA- and ERK-upregulated genes****RA-upregulated genes**

Gene set	Description	p-value	FDR q-value
HALLMARK_ESTROGEN_RESPOSE_EARLY	Genes defining early response to estrogen.	3.37E-26	1.69E-24
HALLMARK_ESTROGEN_RESPOSE_LATE	Genes defining late response to estrogen.	2.13E-16	5.33E-15
HALLMARK_UV_RESPONSE_DN	Genes down-regulated in response to ultraviolet (UV) radiation.	1.53E-13	2.55E-12
HALLMARK_IL2_STAT5_SIGNALING	Genes up-regulated by STAT5 in response to IL2 stimulation.	9.72E-07	1.21E-05
HALLMARK_TGF_BETA_SIGNALING	Genes up-regulated in response to TGFB1 [GeneID=7040].	1.24E-05	1.23E-04
HALLMARK_TNFA_SIGNALING_VIA_NFKB	Genes regulated by NF-kB in response to TNF [GeneID=7124].	1.48E-05	1.23E-04
HALLMARK_EPITHELIAL_MESENCHYMAL_TRANSITION	Genes defining epithelial-mesenchymal transition, as in wound healing, fibrosis and metastasis.	1.85E-04	8.39E-04
HALLMARK_G2M_CHECKPOINT	Genes involved in the G2/M checkpoint, as in progression through the cell division cycle.	1.85E-04	8.39E-04
HALLMARK_GLYCOLYSIS	Genes encoding proteins involved in glycolysis and gluconeogenesis.	1.85E-04	8.39E-04
HALLMARK_HEME_METABOLISM	Genes involved in metabolism of heme (a cofactor consisting of iron and porphyrin) and erythroblast differentiation.	1.85E-04	8.39E-04
HALLMARK_P53_PATHWAY	Genes involved in p53 pathways and networks.	1.85E-04	8.39E-04
HALLMARK_APOPTOSIS	Genes mediating programmed cell death (apoptosis) by activation of caspases.	8.56E-04	3.57E-03

**ERK-upregulated genes**

Gene set	Description	p-value	FDR q-value
HALLMARK_INTERFERON_GAMMA_RESPONSE	Genes up-regulated in response to IFNG [GeneID=3458].	4.89E-28	2.45E-26
HALLMARK_INTERFERON_ALPHA_RESPONSE	Genes up-regulated in response to alpha interferon proteins.	8.66E-26	2.16E-24
HALLMARK_E2F_TARGETS	Genes encoding cell cycle related targets of E2F transcription factors.	1.27E-13	2.12E-12
HALLMARK_G2M_CHECKPOINT	Genes involved in the G2/M checkpoint, as in progression through the cell division cycle.	7.61E-04	7.61E-03
HALLMARK_TNFA_SIGNALING_VIA_NFKB	Genes regulated by NF-kB in response to TNF [GeneID=7124].	7.61E-04	7.61E-03