Table S5. Upstream regulators and their potential targets in summer granulosa cells

Upstream Regulator	Molecule Type	Predicted Activation / Inhibition State	Activation z-score	p-value of overlap	Target molecules in dataset
Upstream regulators showing significantly different expression in summer granulosa cells					
↓↓MAFB	other			6.70×10^{-3}	↓↓AKR1B10, ↓↓MAFB
Upstream regulators (not showing significantly different expression in summer granulosa cells) with predicted activation/inhibition state (|z|>1.96)					
OSM	cytokine	Inhibited	-2.236	3.59×10^{-2}	↓↓AKR1B10, ↑↑AKR1C1/AKR1C2, ↓↓PYGL, ↑↑RORA, ↑↑SYNE1
Upstream regulators (not showing significantly different expression in summer granulosa cells) with uncharacterized activation/inhibition state (|z|<1.96)					
Vegf	group		1.408	5.48×10^{-4}	↑↑HOPX, ↑↑MID1, ↓↓MYCN, ↓↓SHISA2, ↑↑SLC20A1, ↑↑TJP1, ↑↑VWF
hydrogen peroxide	chemical - endogenous mammalian		1.387	1.71×10^{-2}	↑↑AKR1C1/AKR1C2, ↑↑EZR, ↓↓F2RL1, ↑↑SLC20A1, ↑↑TGFBR3
PDLIM2	other		1.342	1.71×10^{-5}	↓↓F2RL1, ↑↑KCTD12, ↓↓NAV1, ↓↓STC2, ↓↓SUSD3
TP53	transcription regulator		1.276	3.64×10^{-2}	↑↑ACSL3, ↑↑ALDH9A1, ↑↑ANXA4, ↑↑COL14A1, ↑↑EZR, ↑↑H2AFY, ↑↑INPP4A, ↑↑PTPRM, ↑↑TJP1
TGFB1	growth factor		1.086	3.60×10^{-3}	↑↑ACSL3, ↑↑AKR1C1/AKR1C2, ↑↑ARID5B, ↓↓F2RL1, ↑↑MID1, ↓↓MYCN, ↑↑RBMS3, ↑↑RORA, ↑↑SLC20A1, ↓↓STC2, ↑↑TGFBR3, ↓↓VAT1L, ↑↑VWF
CEBPA	transcription regulator		1.000	4.08×10^{-2}	↓↓AKR1B10, ↑↑AKR1C1/AKR1C2, ↓↓MYCN, ↑↑RORA
IGF1	growth factor		0.789	4.90×10^{-2}	↑↑AKR1C1/AKR1C2, ↓↓MYCN, ↑↑SLC20A1, ↑↑TJP1
HOXA10	transcription regulator		0.762	4.30×10^{-4}	↓↓KCNAB1, ↓↓LYZ, ↓↓MYCN, ↓↓PTGER3, ↑↑TGFBR3
EGF	growth factor		0.555	2.35×10^{-2}	↑↑ALCAM, ↑↑EZR, ↑↑MT3, ↓↓MYCN, ↑↑TJP1
F2	peptidase		0.343	1.21×10^{-2}	↓↓F2RL1, ↑↑TFPI, ↑↑TJP1, ↑↑VWF
Cg	complex		-0.152	7.05×10^{-3}	↓↓AKR1B10, ↓↓F2RL1, ↑↑RORA, ↑↑SLC20A1, ↑↑TGFBR3
STAT4	transcription regulator		-0.132	6.93×10^{-3}	↑↑MLLT3, ↓↓PYGL, ↑↑RORA, ↓↓STC2
HOXD10	transcription regulator		0.000	6.68×10^{-5}	↑↑EZR, ↑↑TFPI, ↑↑TJP1, ↑↑USP15
FOXP2	transcription regulator			1.20×10^{-4}	↑↑HOPX, ↓↓MYCN
LONP1	peptidase			5.36×10^{-4}	↓↓MT-ATP8, ↓↓MT-ND4L
PI3K (family)	group			6.80×10^{-4}	↓↓AKR1B10, ↑↑AKR1C1/AKR1C2, ↑↑TJP1
CAV1	transmembrane receptor			6.97×10^{-4}	↑↑SLC20A1, ↑↑TFPI, ↑↑TJP1, ↑TMEM87A
FOXP1	transcription regulator			2.44×10^{-3}	↑↑HOPX, ↓↓MYCN
SBDS	other			3.33×10^{-3}	↑↑AKR1C1/AKR1C2, ↑↑COL14A1, ↓↓MAFB

ADTRP	other	3.51×10^{-3}	↑↑TFPI
CLDN9	other	3.51×10^{-3}	↑↑TJP1
SYMPK	other	3.51×10^{-3}	↑↑TJP1
MYT1L	transcription regulator	3.51×10^{-3}	↑↑RBFOX1
LRRN1	other	3.51×10^{-3}	↓↓MYCN
B4GALNT2	enzyme	3.51×10^{-3}	↑↑VWF
WASF1	other	3.51×10^{-3}	↑↑EZR
TGFB3	growth factor	4.16×10^{-3}	↓↓F2RL1, ↑↑TGFBR3, ↑↑TJP1
FGF2	growth factor	6.88×10^{-3}	↓↓AKR1B10, ↑↑SLC20A1, ↑↑TFPI, ↑↑TGFBR3, ↑↑VWF
NTN4	other	7.00×10^{-3}	↑↑TJP1
VANGL2	other	7.00×10^{-3}	↑↑PRICKLE2
IL15	cytokine	7.84×10^{-3}	↑↑H2AFY, ↓↓HMCN1, ↑↑MLLT3, ↓↓PYGL, ↑↑TJP1
mir-34	microRNA	7.86×10^{-3}	↑↑MLLT3, ↓↓MYCN
NKX2-5	transcription regulator	7.86×10^{-3}	↑↑HOPX, ↓↓MYCN
ETV5	transcription regulator	9.54×10^{-3}	↑↑ALCAM, ↑↑TJP1
GDP	chemical - endogenous mammalian	1.05×10^{-2}	↑↑TGFBR3
Vacuolar H+ ATPase	complex	1.05×10^{-2}	↓↓TMEM106B
gelatinase	group	1.05×10^{-2}	↑↑TJP1
MZB1	other	1.05×10^{-2}	↑↑TJP1
NPHS1	other	1.05×10^{-2}	↑↑TJP1
Ptger2	G-protein coupled receptor	1.05×10^{-2}	↓↓PTGER3
GIPC1	other	1.05×10^{-2}	↑↑TGFBR3
KIRREL	other	1.05×10^{-2}	↑↑TJP1
NPHS2	other	1.05×10^{-2}	↑↑TJP1
VEZF1	transcription regulator	1.05×10^{-2}	↑↑USP15
MXD3	transcription regulator	1.05×10^{-2}	↓↓MYCN
hydrocortisone	chemical - endogenous mammalian	1.06×10^{-2}	↑↑EZR, ↑↑MT3, ↓↓STC2
IL11	cytokine	1.14×10^{-2}	↑↑EZR, ↑↑VWF
IGFBP2	other	1.14×10^{-2}	↑↑COL14A1, ↑↑RBMS3
RXRA	ligand-dependent nuclear receptor	1.14×10^{-2}	↑↑ACSL3, ↑↑AKR1C1/AKR1C2, ↓↓MYCN, ↑↑RORA
SYVN1	transporter	1.15×10^{-2}	↑↑ACSL3, ↑↑SLC20A1, ↓↓TMEM106B
WT1	transcription regulator	1.29×10^{-2}	↑↑EZR, ↓↓MYCN, ↑↑SLC20A1
PML	transcription regulator	1.33×10^{-2}	↑↑ANXA4, ↓↓LYZ

ZFYVE9	peptidase	1.39×10^{-2}	↑↑TJP1
LRP8	transmembrane receptor	1.39×10^{-2}	↓↓GPX4
TBX20	transcription regulator	1.39×10^{-2}	↓↓MYCN
GRPR	G-protein coupled receptor	1.39×10^{-2}	↓↓MYCN
miR-101-3p (and other miRNAs w/seed ACAGUAC)	mature microRNA	1.39×10^{-2}	↓↓MYCN
QKI	other	1.39×10^{-2}	↑↑H2AFY
F2R	G-protein coupled receptor	1.49×10^{-2}	↑↑TJP1, ↑↑VWF
Calmodulin	group	1.71×10^{-2}	↑CORO6, ↑↑MAP9
GTP	chemical - endogenous mammalian	1.74×10^{-2}	↑↑TGFBR3
chondroitin sulfate E	chemical - endogenous mammalian	1.74×10^{-2}	↑↑PRICKLE1
ELAVL4	other	1.74×10^{-2}	↓↓MYCN
FZD5	G-protein coupled receptor	1.74×10^{-2}	↑↑TJP1
NAA10	enzyme	1.74×10^{-2}	↑↑TGFBR3
PLAA	other	1.74×10^{-2}	↑↑ANXA4
ACTN4	other	1.74×10^{-2}	↓↓MYCN
succinylacetone	chemical - endogenous mammalian	1.74×10^{-2}	↓ALAS1
prostaglandin E2	chemical - endogenous mammalian	1.84×10^{-2}	↓↓F2RL1, ↓↓MAFB, ↑↑TGFBR3, ↑↑TJP1
BSCL2	other	1.88×10^{-2}	↑MARK1, ↓↓PYGL
PRKAG3	kinase	2.03×10^{-2}	↓ALAS1, ↑↑REV3L, ↓↓SHISA2
PROCR	other	2.09×10^{-2}	↑↑TJP1
LIMS2	other	2.09×10^{-2}	↑↑TJP1
TNFRSF14	transmembrane receptor	2.09×10^{-2}	↓↓F2RL1
ERG	transcription regulator	2.13×10^{-2}	↓↓MYCN, ↓↓SVIL, ↑↑VWF
PKD1	ion channel	2.23×10^{-2}	↑↑MID1, ↑↑SYNE1, ↑↑VWF
PDX1	transcription regulator	2.30×10^{-2}	↑↑MDH1, ↓↓PTGER3, ↑↑TGFBR3
CDX2	transcription regulator	2.32×10^{-2}	↑↑MLLT3, ↓↓MYCN
MYOD1	transcription regulator	2.40×10^{-2}	↓↓MAFB, ↑↑TGFBR3, ↑↑TJP1
tryptase	group	2.43×10^{-2}	↓↓F2RL1
MRPL12	other	2.43×10^{-2}	↓↓MT-ND2

NPAS2	transcription regulator	2.43×10^{-2}	↓ALAS1
GLI1	transcription regulator	2.44×10^{-2}	↑↑EZR, ↓↓MYCN, ↑↑SYNE1
MIF	cytokine	2.45×10^{-2}	↓↓F2RL1, ↓↓MYCN
CCL5	cytokine	2.65×10^{-2}	↑↑ALCAM, ↓↓F2RL1
TCF7L1	transcription regulator	2.77×10^{-2}	↓↓SLC26A2
TIP60	complex	2.77×10^{-2}	↓↓MYCN
LIMS1	other	2.77×10^{-2}	↑↑TJP1
miR-203-3p (and other miRNAs w/seed UGAAAUG)	mature microRNA	2.77×10^{-2}	↓↓F2RL1
POU3F3	transcription regulator	2.77×10^{-2}	↓↓PTGER3
HBP1	transcription regulator	2.77×10^{-2}	↓↓MYCN
SDC2	other	2.77×10^{-2}	↑↑TGFBR3
pepstatin	chemical - protease inhibitor	2.77×10^{-2}	↓↓STC2
EDN1	cytokine	2.81×10^{-2}	↑↑ANXA4, ↑↑EZR, ↑↑VWF
dinoprost	chemical - endogenous mammalian	2.85×10^{-2}	↑↑AKR1C1/AKR1C2, ↑↑ANXA4
TRAF2	enzyme	2.85×10^{-2}	↑↑ANXA4, ↓↓PYGL
PAX3	transcription regulator	3.08×10^{-2}	↓↓F2RL1, ↓↓GPX4, ↓↓PTGER3
LIN28B	other	3.11×10^{-2}	↓↓MYCN
MEMO1	other	3.11×10^{-2}	↓↓STC2
mir-214	microRNA	3.11×10^{-2}	↑↑ALCAM
ERP29	transporter	3.11×10^{-2}	↑↑TJP1
TRAF3	enzyme	3.14×10^{-2}	↑↑ANXA4, ↓↓PYGL
progesterone	chemical - endogenous mammalian	3.25×10^{-2}	↑↑HOPX, ↓↓KCNAB1, ↓↓MYCN, ↓↓PTGER3, ↑↑TGFBR3
mir-210	microRNA	3.44×10^{-2}	↑↑H2AFY, ↓↓MRPL36
mir-130	microRNA	3.45×10^{-2}	↓↓MAFB
miR-130a-3p (and other miRNAs w/seed AGUGCAA)	mature microRNA	3.45×10^{-2}	↓↓MAFB
NMNAT1	enzyme	3.45×10^{-2}	↑↑TFPI
ALK	kinase	3.45×10^{-2}	↓↓MYCN
FLT1	kinase	3.45×10^{-2}	↑↑VWF
ACKR3	G-protein coupled receptor	3.45×10^{-2}	↑↑VWF

GBX2	transcription regulator	3.45×10^{-2}	↓↓MAFB
dihydrotestosterone	chemical - endogenous mammalian	3.47×10^{-2}	↓ALAS1, ↓↓GPX4, ↑MARK1, ↑↑TFPI, ↑↑TGFBR3
FBXO32	enzyme	3.51×10^{-2}	↓↓MYCN, ↓↓PTGER3
IGF1R	transmembrane receptor	3.63×10^{-2}	↓↓MYCN, ↑↑TJP1, ↑TMEM87A
RAF1	kinase	3.67×10^{-2}	↑↑FAM13A, ↑↑MT3, ↓↓SLC26A2
HNRNPAB	enzyme	3.79×10^{-2}	↑↑TJP1
BMP6	growth factor	3.83×10^{-2}	↓↓MYCN, ↑↑SLC20A1
TGFB2	growth factor	3.83×10^{-2}	↑↑MLLT3, ↑↑TGFBR3
phosphate	chemical - endogenous mammalian	3.98×10^{-2}	↑↑SLC20A1, ↓↓STC2
COL18A1	other	4.06×10^{-2}	↓↓F2RL1, ↑↑VWF
FH	enzyme	4.13×10^{-2}	↑↑AKR1C1/AKR1C2
SATB2	transcription regulator	4.13×10^{-2}	↑↑AUTS2
PER2	other	4.13×10^{-2}	↓ALAS1
EPHA2	kinase	4.13×10^{-2}	↑↑TJP1
TFF3	other	4.13×10^{-2}	↑↑TJP1
KLF13	transcription regulator	4.13×10^{-2}	↓ALAS1
AKT1	kinase	4.22×10^{-2}	↓↓AKR1B10, ↑↑AKR1C1/AKR1C2, ↑↑TGFBR3
HSPA9	other	4.46×10^{-2}	↓↓MYCN
UCP1	transporter	4.46×10^{-2}	↓ALAS1
SDCBP	enzyme	4.46×10^{-2}	↑↑TJP1
CCND1	other	4.51×10^{-2}	↑MARK1, ↑↑RBMS3, ↓↓TMEM219
CYP1A1	enzyme	4.56×10^{-2}	↑↑ANXA4, ↑↑MID1
miR-30c-5p (and other miRNAs w/seed GUAAACA)	mature microRNA	4.64×10^{-2}	↓↓GALNT7, ↑TMEM87A
PPARG	ligand-dependent nuclear receptor	4.75×10^{-2}	↑↑ALDH9A1, ↑↑MDH1, ↓↓PYGL, ↑↑TJP1
SLC9A3R1	other	4.80×10^{-2}	↑↑EZR
mir-122	microRNA	4.80×10^{-2}	↑MARK1
RARA	ligand-dependent nuclear receptor	4.90×10^{-2}	↓↓MAFB, ↓↓MYCN

Symbols for regulators with increased (or decreased) expression and fold-change>=2 are preceded with ↑↑ (or ↓↓). Symbols for genes with increased (or decreased) expression and fold-change<2 are preceded with ↑ (or ↓).