

Supp. Table.1 Cell cycle related genes and their miRNAs regulators

Gene	Function	Regulatory miRNAs
Cyclin A	Activate CDK1 (M phase) & CDK 2 (S phase)	let-7, mir-125a, mir-24,
Cyclin B	Regulate the progression of the cells into & out of M phase of the cell cycle.	mir-24
Cyclin D	Drives the G1/S phase transition	let-7, mir-15a-16-1 mir-17/20, mir-19a, mir-26a, mir-34a-c, mir-302a, mir-195, mir-449a, mir-193b, mir-302a
Cyclin E	Involved in transition from G1 to S phase	mir-15, mir-26a, mir-34a, mir-29c, mir-195, mir-16
Cdc25A	Activation of CDKs by removing phosphate	let-7, mir-125b, mir322/424, mir-449a/b, mir-15, mir-21, mir-100, mir-449a
Cdk2/4/6	Cyclin- CDK complex phosphorylated their substrate & activate them	let-7, mir-15 family, mir-24, mir-124a, mir-125b, mir-129, mir-137, mir-449a/b, mir-372, mir-34a, mir-195, mir-107, mir-15/16
Rb	Suppress cell cycle (Tumor suppressor protein)	mir-17-92, mir-106a, mir-290, mir-132/212
E2f	Transcription factor having role in G1/S transition	mir-17-92, mir-24, mir-125, mir-149, mir-195, mir-210, mir-330, mir-331, mir-34a, mir-128a, mir-195, mir-223
P19	Inhibits CDKs	mir-24, mir-31
P16	Inhibits CDK4/6	mir-24,
P53	Activate p21 (Tumor suppressor protein)	mir-504, mir-1285, mir-33
CMyc	Activate cyclin D, CDK4/6 and cdc25A (Oncogene)	let-7, mir-24, mir-145, mir-34a
Mcm2	Initiation of genome replication	mir1296
P21	Inhibits cdc2 and CDK2	mir-17-92, mir-106b, mir-181, mir-372, mir-504, mir-194/215, mir-194, mir-34
P27,p57, p19, p16	Prevents the activation of cyclin E- CDK2 or cyclin D- CDK4complexes (negative regulator of cell proliferation)	mir221/222, mir-92b, mir-17-92, mir-221&222
Cdc34	Ubiquitin-mediated degradation of cell cycle regulators	let-7
Wee1	Suppress CDK1-cyclinb1 complex	mir-128a, mir-195, mir-516-3p, mir-372, mir-155
Cdc27, APC	Target cell cycle proteins for degradation	mir-15
PLK1	Phosphorylates cdc25c & activates CDK1-cyclin B1 complex, trigger G2/M transition	mir100, mir-593*
PTEN	Tumor suppressor gene	mir-26a, mir-221&222, mir-216a, mir-217, mir-486, mir-214, mir-17-92, mir-21,
WEE1	Inhibit CDK1/2	mir-128a, mir-195, mir-516-3p
PI3K	Regulate G1/S and G2/M transition	Mir-126

Supp. Table. 2 Apoptosis related genes and their miRNAs regulators

Gene	Function	Regulatory miRNAs
Caspase-10/8	Initiator caspases, activates casp 3, 6,7/ Pro-apoptotic/	mir-186*
Caspase-9	Cellular destruction/ Pro-apoptotic	mir-24a, mir-133
Caspase-3/7	Cellular destruction/ Pro-apoptotic	let-7a, mir-378, mir-155
BAX	Increase mitochondrial outer membrane permeability/ Pro-apoptotic	mir-128, mir-365
PUMA	induce cytochrome c release/ Pro-apoptotic	mir-221, mir-222, mir-483-3p, mir-bart5
Bak	govern MOMP / Pro-apoptotic	mir-125b
Bim	Interact with other members of the BCL-2 protein family/ Pro-apoptotic.	mir-17-5p, mir-19, mir-25, mir-32, mir-92, mir-181a
P27	Inhibits CDKs/ Pro-apoptotic proteins	mir-221/222
BCL-2	govern MOMP /Anti- apoptotic	mir-15a, mir-15b, mir-204, mir-148a, mir-24-2c, mir-16-1, mir-29 family, mir-34, mir-34c, mir-143, mir-153, mir-181a, mir-181b, mir-195, mir-365-2
BCL-W	Govern MOMP /Anti- apoptotic	mir-15b, mir-122, mir-133b, mir-205
BCL-XL	Govern MOMP / Anti- apoptotic	mir-491, mir-133a, mir-608, let-7c, let-7g
MCL1	Govern MOMP /Anti- apoptotic	mir-15a, mir-16-1, mir-29 family, mir-101, mir-133b, mir-153, mir-193b
PED	Inhibits the assembly of DISC/ anti-apoptotic	mir-212
c-FLIP	Inhibits the assembly of DISC/ anti-apoptotic	mir-512-3p
XIAP	Inhibits caspase 3,7,9/ anti-apoptotic	mir-23a, mir-24
Survivin	Inhibits active caspase 9/ anti-apoptotic	mir-218, mir-203
API-5	suppresses E2F1-induced apoptosis / Apoptosis inhibitor	mir-224
E2F1	Regulate various protien in apoptotic pathway/ Apoptosis regulator	mir-93, mir-106b, mir-149,*
NF-kb	Activate anti-apoptotic proteins/ Apoptosis inhibitor	mir-520, mir-372, mir-373, mir-30e, mir-195
P53	Activate transcription of pro-apoptotic Bcl-2/ Apoptosis inducer	mir-125b, mir-214, mir-30, mir-504, mir-138, mir-380-5p
Smad	Downregulate Bcl-E], Bcl-2, while upregulate Bax/ Apoptosis inducer	mir-224, mir-21
Fas L, TRAIL	Binding to their receptor, induces death receptor signaling	mir-21, mir-590
FAF1	Mediates programmed cell death,	mir-24
FAP-1	Inhibits Fas induced apoptosis	mir-200c

P21	Blocks apoptosis by interacting with procasp-3, casp-8, or by inducing cell cycle arrest	mir-17-5p, mir-106b, mir-93
CDC42 & p85a	P53 upregulation	mir-29a, mir-29b, mir-29c
Apaf-1	Form apoptosome after binding to cyt c and pro-caspase-9	mir-23a/b, mir-27a/b
FAS/ DR4,5	Activates extrinsic death signaling	mir-20a, mir-196b, mir-146a
FADD	Activates caspase and mediate extrinsic death signaling	mir-155, mir-128a
PTEN	Induces apoptosis by PI3K/AKT signaling	
MOMP; mitochondrial outer membrane permeabilization		

Supp Table. 3 EMT, Invasion and metastasis related genes and their miRNAs regulators

Gene	role	Regulatory miRNAs
Snail1	Downregulation of E-cadherin	mir-30a, mir-9, mir-34a, mir-203, mir-153, mir-661
SNAIL2	Downregulation of E-cadherin	mir-124, mir-203, mir-204/211, mir-200 family, mir-1
ZEB1/ZEB2,	Downregulation of E-cadherin	mir-200 family, mir-205, mir153, mir-138, mir-215, mir-708
Twist1	Promote EMT	let-7d, mir-214, mir-580,
SMAD	Mediate TGF- β signaling	mir-216a/217, , mir-146b-5p, mir-146
E-cadherin	Epithelial marker	mir-9
TGFβR2,	Mediate TGF- β signaling	mir-204, mir-373/520c
Slug	transcriptional repressor of E-cadherin	mir-204, mir-203, mir-1, mir-200 family
Wnt/β-catenin signaling	Promote EMT	mir-200a, mir-371-373, mir-29
TGF-β	Promote EMT	mir-192, mir-23, mir-215, mir-155, mir-106b-25, mir-21, mir-99a/b, mir-520
Notch signaling	Promote EMT	mir-23b, mir-181, mir-124a, mir-200, mir-1
APC	Involved in Wnt/ β -catenin signaling	mir-27
HBP1	Activation of Wnt/ β -catenin signaling	mir-17-5p
RAS	Activation of MAPK pathway	let-7, mir-143
RHOA	Endothelial activation and mesenchymal invasion	mir-155, mir-31, mir-133a, mir-185
NFkB	Up-regulation of ZEB1	mir-146a,b, mir-9
MMP2, MMP9	Tissue remodeling, migration and invasion	mir-29b, mir-21
TIMP	MMP inhibitor	mir-221-222, mir-21
CD44	Promote invasion via PI3K/AKT or Rho signaling	mir-373/520c, mir-328, mir-34a
TTP	Degradation of TNF- α , Cox2, IL-3, IL-8, VEGF	mir-29a
BMI1	Regulate snail expression and promote metastasis	mir-194, mir-15b
SOX4,	Regulate Ezh2 and EMT metastasis	mir-335, mir-138
IL8,	Induces metastasis by MMP activation	mir-17/20
c-MET`	invasion	mir-23b, mir-34a
Integrin α5,	Cell-cell and ECM interactions	mir-31`
EZH2	Transcription repression of E-cadherin	mir-101
TRPS1, ESR1,	EMT-invasion-metastasis	mir-221/222
StarD10, Nectin-1	EMT	mir-661
TPM1, PDCD4, RECK, BMD6, PTEN, MARCKS, Cdc25A, BTG2, Mapsin, Her2	Invasion, migration	mir-21
HOXD10, KLF4	invasion, migration	mir-10b
Mmp11, HMGA2,	Invasion, migration	let-7

Egfr, FAK, IGFR	EMT-invasion-metastasis	mir-7
TNC, SP1	Invasion, migration	mir-335
ApoE, DNAJA4	Metastasis-angiogenesis	mir-199a-5p, mir-1908, mir-199a-3p
IL8, CXCL1, CK8,	Invasion/migration	mir-17/20

Supp. Table. 4 Angiogenesis related genes and their miRNAs regulators

Gene	Function	Regulatory miRNAs
FGF	Growth factor promoting angiogenesis signaling	mir-503, mir-130a, mir0-132
HGF	Growth factor promoting angiogenesis signaling	mir-26a
VEGF	Growth factor promoting angiogenesis signaling	mir-1, mir-206, mir-503, mir-199a, mir-125b, mir-424, mir-15a/b, mir-16, mir-20a/b, mir-361-5p, mir-214, mir-351-5p,, mir-191, mir-155, mir-31, mir-17-5p, mir-18a, mir-101, mir-130a, mir-296, mir-132, mir-126, mir-10, mir-196, mir-9, mir-29b
EGF	Growth factor promoting angiogenesis signaling	mir-126
EGFR	Promotes angiogenesis signaling by binding to EGFR	mir-7, mir-128b
FGFR	Promotes angiogenesis signaling by binding to FGF	mir-424, mir-16,
VEGFR	Promotes angiogenesis signaling by binding to VEGF	mir-424, mir-16, mir-17, mir-200, mir-17-92,
Integrin alpha5	mediate cell-matrix and cell-cell interactions	mir-92a
JAK	Involved in JAK/STAT signaling	mir-17-92
GAX, HOXA5	Angiogenesis inhibitor	mir-130a
HER2/3	Upregulation of VEGF	mir-125b, mir-199
HIF-1	transcriptional activation of VEGF	mir-107, mir-519c, mir-20b
PTEN,	Regulate PI3K/Akt/VEGF signaling	mir-21, mir-132, mir-17-92
PDCD4,	Regulate angiopoietin-2	mir-21
AT1R	Upregulate VEGF	mir-155
E2F1	Transcription control of VEGF	mir-17-5p
KLF4/5	Transcription factor regulating various gene expression	mir-143/145
Smad-1/4	Mediate TGF-beta signaling promoting angiogenesis	mir-26a
Sprouty1	a negative regulator of VEGF signaling	mir-21
THBS	mediates cell-to-cell and cell-to-matrix interactions	mir-17-92, let-7f, mir-27b
ETS	Transcription factor for VEGF, HGF, VEGFR, MMPs	mir-200b
EphrinA3	Determine formation of arteries or veins	mir-210
IGF-1	Cell survival pathway	mir-320
Cox10	Promote angiogenesis	mir-210
TSP1	Angiogenesis inhibitor	let-7, mir-27b, mir-19a/b, mir-17-92
TIMP-1	Inhibit MMPs	let-7, mir-17-5p
HGS	Degrades VEGFR2/ antiangiogenic	mir-296
PIK3R2	Promote angiogenesis	mir-126,
ANGPT	vessel-destabilizing controlling vessel regression	mir-351, mir-126
JAG-1/ DLL4	Notch signaling and vascular development	mir-21, mir-199b/mir-30
MMP	Degrade ECM	mir-9, mir-29b, mir-145

Supp. Table. 5 Metabolism related gene and miRNAs regulation

Gene	Metabolism	Regulatory miRNAs
GLUT3	Glucose metabolism	mir-195-5p, mir-21, mir-106a
GLUT1	Glucose metabolism	mir-1291, mir-19a, mir 138, mir 150, mir-19b, mir 199a-5p, mir-130b, mir 532-5p, mir-301a, mir-21
GLUT4	Glucose metabolism	mir-133, mir-223, mir 93, mir-150
SLC45A3	Glucose metabolism	mir-32
SMAD4	Glucose metabolism	mir-23a
PDHX	Glucose metabolism	mir-26a
PKM1	Glucose metabolism	mir-125
PKM2	Glucose metabolism	mir-133a/b, mir-326, mir-99a mir-124, mir 137, mir-122,, mir-340, mir-21,
LDHB	Glucose metabolism	mir-375, mir-21
PGI	Glucose metabolism	mir-200
LDH-A	Glucose metabolism	mir-17-3p, mir-21
PFKP/m	Glucose metabolism	mir-520, mir-320
SDH	Glucose metabolism	mir-210
Hexokinase 2	Glucose metabolism	mir-143 mir-155, mir-125, mir-34a, mir-21
Hexokinase 1	Glucose metabolism	mir-138, mir-34a, mir-21
IDH2	Glucose metabolism	mir-183
ISCU 1/2	Glucose metabolism	mir-210
TPI1	Glucose metabolism	mir-195, mir-15a/16-1, mir-122
GAPDH	Glucose metabolism	mir-644a
AldoA	Glucose metabolism	mir-122, mir- 15a/16-1
GPI	Glucose metabolism	mir 200s mir 302b, mir 17-5p
Acetyl Co A	Glucose metabolism	mir-103, mir-107
Citrate synthase	Glucose metabolism	mir-152, mir-148a, mir-148b, mir-299-5p, mir-19b, mir-122a, mir-421, mir-494 & mir-19a
ERRγ, GABPA , ESRRG,	Warburg effect	mir-378*
HNF-alpha/stat3	Lipid metabolism	mir-24, mir-629
PCTP, LIPA, GSS, ACSS1, SCD1, AKT2,	Lipid metabolism	mir-125b, mir-34a, mir-375

Agpat1, Cidec, Stard4	Lipid metabolism	mir-122
ACSL1	Lipid metabolism	mir-205
PPAR γ	Lipid metabolism	mir-130
SLC16A1	Lipid metabolism	mir-124
SREBP-1/2	Lipid metabolism	mir-185, mir-342, mir-33a & mir-33b
ABCA1	Cholesterol metabolism.	mir-33a/b, mir-106b, mir-758
ABCG, NPC1 CROT, HADHB, PRKAA1	Cholesterol metabolism.	mir-33a/b
LDHB	Lactate metabolism	mir-375
MCT1	Lactate metabolism	mir-29a/b, mir-124
Insulin	Lactate metabolism	mir-103, mir-107, mir-375, mir-29b
MTC1	Lactate metabolism	mir-29a/b, mir-124
POX/PRODH, Proline oxidase,	Amino acid metabolism	mir-23b*
Myc	Amino acid metabolism	mir-23a/b
CAT-1	Amino acid metabolism.	mir-122
	Amino acid metabolism.	mir29b

α -ketoacid dehydrogenase complex

NMN, NNMT	Nicotinamide metabolism	mir-1291
IRS2	Insulin signaling	mir-33a/b, let-7
SIRT6;/AMPK	Insulin signaling	mir-33a/b
Caveolin-1	Insulin signaling	mir-103/107
IGF-1R, INSR, HMGA2	Insulin signaling	let-7
SIRT1	Insulin signaling	mir-34a
P53	P53 signaling	mir-125b, mir-504, mir-25, mir-30d, mir-34a, mir-122, mir-29, mir-192, mir-194 & mir-215
BMI1	P53 signaling	mir-218
AKT	PI3K/Akt/mTOR signalling	mir-21, mir-143
PI3K	PI3K/Akt/mTOR signalling	mir-126, mir-143, mir-221, mir-100, mir-29, mir-199-3p
PTEN	PI3K/Akt/mTOR signalling	mir-126, mir-21, mir-214, mir-17-92
mTOR	PI3K/Akt/mTOR signalling	mir-100, mir-199a

FOXO1	PI3K/Akt/mtor signalling	mir-223
IRS1	PI3K/Akt/mtor signalling	mir-126
CAB39	AMPK signaling	mir-451, mir-195
PKM2	AMPK signaling	mir-126
cMyc	HIF1 /MYC signaling	mir-429, mir-135a, mir-33b, mir-223, let-7a
VHL	HIF1 /MYC signaling	mir-92-1
GPD1L	HIF1 /MYC signaling	mir-210
HIF-1alpha	HIF1 /MYC signaling	mir-199a, mir-210, mir-424, mir-92-1, mir-21