

Table S1: Senescence-associated genes targeted by miRNAs in MetS-MSCs

	Gene ID	Description	Function
1	ABL1	ABL Proto-Oncogene 1	ABL deficiency shunts BMP signalling from Smad1/5/8 to Erk1/2, leading to p16 upregulation and osteoblast senescence.
2	MAPK14	Mitogen-Activated Protein Kinase 14	One of the four p38 MAPKs that play an important role in the cascades of cellular responses evoked by extracellular stimuli.
3	CDKN1A	Cyclin-Dependent Kinase Inhibitor 1A	Encodes protein P21, binds to and inhibits the activity of cyclin-cyclin-dependent kinase-2, thus functions as a regulator of cell cycle progression at G1.
4	CXCL1	C-X-C Motif Chemokine Ligand 1	The senescence-associated secretory phenotype (SASP) factor CXCL1 (also known as KC)
5	IL1B	Interleukin-1 Beta	A member of the interleukin-1 cytokine family, controls various cellular functions, including proliferation, differentiation and cell survival/apoptosis.
6	CRP	C-Reactive Protein	Displays several functions associated with host defense.
7	HRAS	GTP Binding Protein H-Ras	GTPase HRas, also known as transforming protein p21. H-Ras activates Raf kinases like c-Raf, the next step in the MAPK/ERK pathway.
8	TERT	Telomerase Reverse Transcriptase	Playing a role in cellular senescence, as it is normally repressed in postnatal somatic cells resulting in progressive shortening of telomeres.

9	TBX3	T-Box 3	T-Box 3 and T-Box 2 can bypass senescence by repressing ARF and p21
10	FN1	Fibronectin-1	Fibronectin is involved in cell adhesion and migration processes, including embryogenesis, wound healing, blood coagulation, host defense, and metastasis.
11	THBS1	Thrombospondin-1	Thrombospondin-1 signaling through CD47 inhibits cell cycle progression and induces senescence in endothelial cells
12	COL1A1	23957394 Collagen Type I Alpha 1 Chain	The pro-alpha1 chains of type I collagen, whose triple helix comprises two alpha-1 chains and one alpha-2 chain. Resistance to collagen cleavage accelerates cellular aging.
13	COL3A1	Collagen Type III Alpha 1 Chain	Related to this gene are integrin and SMAD binding. An important paralogue is COL1A1.
14	IGF1R	Insulin-Like Growth Factor 1 Receptor	The major factor in the IGF-1/IGF-1R system, and exerts pleiotropic effects on cell growth, differentiation, development, and tissue repair.
15	PCNA	Cyclin	The encoded protein acts as a homotrimer and helps increase the processivity of leading strand synthesis during DNA replication. In response to DNA damage
16	PIK3CA	PI3-Kinase Subunit Alpha	Plays a key role by recruiting PH domain-containing proteins to the membrane, including AKT1 and PDK1, activating signaling cascades involved in cell growth and survival.
17	CDKN1B	Cyclin-Dependent Kinase	This gene encodes a cyclin-dependent kinase inhibitor, which shares a limited

		Inhibitor 1B (P27, Kip1)	similarity with CDK inhibitor CDKN1A/p21.
18	IGF1	Insulin Like Growth Factor 1	The major factor in the IGF-1/IGF-1R system a ligand for IGF1R. It initiates a cascade of down- stream signaling events leading to activation of the PI3K-AKT/PKB and the Ras-MAPK pathways.
19	PTEN	Phosphatase And Tensin Homolog	Antagonizes the PI3K-AKT/PKB signaling pathway by dephosphorylating phosphoinositides and thereby modulating cell cycle progression and survival. The unphosphorylated form cooperates with AIP1 to suppress AKT1 activation.
20	PAPPA	Pappalysin 1	Encodes a secreted metalloproteinase that cleaves insulin-like growth factor binding proteins.
21	IGFBP4	Insulin Like Growth Factor Binding Protein 4	The protein binds both insulin-like growth factors (IGFs) I and II and circulates in the plasma in both glycosylated and non-glycosylated forms.
22	SOD2	Superoxide Dismutase 2	A member of the iron/manganese superoxide dismutase family. Among its related pathways are Apoptosis and survival.
23	GADD45A	Growth Arrest And DNA Damage Inducible Alpha	Responds to environmental stresses by mediating activation of the p38/JNK pathway via MTK1/MEKK4 kinase.
24	VIM	Vimentin	Vimentin is attached to the nucleus, endoplasmic reticulum, and mitochondria, either laterally or terminally.
25	CCNA2	Cyclin A2	Binds and activates cyclin-dependent kinase-2 and promotes transition through

			G1/S and G2/M.
26	CDKN2B	Cyclin Dependent Kinase Inhibitor 2B	The encoded protein functions as a cell growth regulator that controls cell cycle G1 progression.
27	MAP2K6	MAPK/ERK Kinase 6	As an essential component of p38 MAP-kinase mediated signal transduction pathway, this gene is involved in many cellular processes, such as stress-induced cell cycle arrest.
28	SERPINE1	Plasminogen Activator Inhibitor-1	Inducing senescence through activating p53-p21-Rb pathway
29	TGFA	Transforming Growth Factor Alpha	This gene encodes a growth factor that is a ligand for the epidermal growth factor receptor, which activates a signaling pathway for cell proliferation, differentiation, and development.
30	CSF1	Colony Stimulating Factor 1	Plays an essential role in regulation of survival, proliferation and differentiation of hematopoietic precursor cells, especially mononuclear phagocytes, such as macrophages and monocytes
31	MAP2K1	MAPK/ERK Kinase 1	Specificity protein kinase which acts as an essential component of the MAP kinase signal transduction pathway.
32	ATM	ATM Serine/Threonine Kinase	This gene belongs to the PI3/PI4-kinase family. This protein is an important cell cycle checkpoint kinase.

33	TERF2	Telomeric Repeat Binding Factor 2	Protein is present at telomeres in metaphase of the cell cycle, is a second negative regulator of telomere length, and plays a key role in the protective activity of telomeres.
34	CALR	Calreticulin	Calcium-binding chaperone that promotes folding, oligomeric assembly, and quality control in the endoplasmic reticulum via the calreticulin/calnexin cycle.
35	CD44	CD44 Molecule (Indian Blood Group)	As an essential component of Chk1/p53/CD44 cascades