

**Supplementary Table 1** The collected senescence-related genes

E2F1  
E2F3  
NF1  
PTEN  
AKT1  
BCL2  
EGFR  
HSP90AA1  
IGF1R  
KRAS  
MYC  
PPP2CA  
PRKCA  
RB1  
TEP1  
TERF1  
TERT  
TNKS  
TP53  
XRCC5  
XRCC6  
ACSS2  
ATP5MC3  
CA4  
CALB1  
COL1A1  
COL3A1  
COL4A5  
CX3CL1  
DIABLO  
FABP3  
GHITM  
NDUFB11  
NREP  
TFRC  
UQCRFS1  
UQCRQ  
ADIPOR2  
ANXA3  
ANXA5  
APOD  
B2M  
C1QA  
C1QB  
C1QC  
C3  
C4A  
CLIC4  
CLU  
CTSS

DCLK1  
DERL1  
EFCAB14  
EFEMP1  
FCGR2A  
FCGR2B  
GBP2  
GFAP  
GNS  
GPNMB  
GSTA1  
H1-2  
HBA1  
HCST  
HLA-G  
IL33  
JCHAIN  
LAPTM5  
LGALS3  
LITAF  
LYZ  
MGST1  
MPEG1  
MSN  
MT1F  
NDRG1  
NPC2  
PCSK6  
PSMD11  
PTGES3  
RASA3  
RNF213  
S100A4  
S100A6  
SERPING1  
SGK1  
SPP1  
TMED10  
TXNIP  
VAT1  
VWF  
ALDH1A1  
BMI1  
CCN4  
CCNB1  
CDC25B  
CKS1BP7  
E2F4  
EGR1  
ID1  
LAMA1

LDB2  
MARCKS  
ALDH1A3  
AOPEP  
CCN2  
CCND1  
CD44  
CDKN1A  
CDKN1C  
CDKN2A  
CDKN2B  
CDKN2D  
CITED2  
CLTB  
COL1A2  
CREG1  
CRYAB  
CXCL14  
CYP1B1  
EIF2S2  
ESM1  
F3  
FILIP1L  
FN1  
GSN  
GUK1  
HBS1L  
HPS5  
HSPA2  
HTATIP2  
IFI16  
IFNG  
IGFBP1  
IGFBP2  
IGFBP3  
IGFBP4  
IGFBP5  
IGFBP6  
IGFBP7  
IGSF3  
ING1  
IRF5  
IRF7  
ISG15  
MAP1LC3B  
MAP2K3  
MDM2  
MMP1  
NDN  
NME2  
NRG1

OPTN  
PEA15  
RAB13  
RAB31  
RAB5B  
RABGGTA  
RAC1  
RBL2  
RGL2  
RHOB  
RRAS  
S100A11  
SERPINB2  
SERPINE1  
SMPD1  
SMURF2  
SOD1  
SPARC  
STAT1  
TES  
TFAP2A  
TGFB1I1  
THBS1  
TNFAIP2  
TNFAIP3  
TSPYL5  
VIM  
ABL1  
AKT3  
ARG2  
ARNTL  
ATM  
ATR  
BCL2L12  
BCL6  
BGLAP  
BMPR1A  
BRCA2  
CALR  
CDK6  
CGAS  
CHEK1  
CHEK2  
CTC1  
DNAJA3  
ECRG4  
EEF1E1  
ERCC1  
FBX05  
FOXM1  
FZR1

H2AX  
HMGA1  
HMGA2  
HRAS  
ICAM1  
ID2  
ING2  
KAT6A  
KIR2DL4  
LIMS1  
LMNA  
MAGEA2  
MAGEA2B  
MAP2K1  
MAP3K3  
MAPK14  
MAPKAPK5  
MARCHF5  
MIF  
MIR10A  
MIR146A  
MIR17  
MIR188  
MIR20B  
MIR21  
MIR217  
MIR22  
MIR34A  
MIR543  
MIR590  
MME  
MNT  
MORC3  
MTOR  
NEK4  
NEK6  
NOX4  
NPM1  
NSMCE2  
NUAK1  
NUP62  
OPA1  
PAWR  
PDCD4  
PLA2R1  
PLK2  
PML  
PNPT1  
PRELP  
PRKCD  
PRKDC

PRMT6  
RBL1  
ROM01  
RSL1D1  
SIRT1  
SLC30A10  
SMC5  
SMC6  
SPI1  
SRF  
TBX2  
TBX3  
TERC  
TERF2  
TP63  
TWIST1  
ULK3  
VASH1  
WNT1  
WNT16  
WRN  
YBX1  
YPEL3  
ZKSCAN3  
ZMIZ1  
ZMPSTE24  
ZNF277  
ZNF354A  
CISD2  
COMP  
COQ7  
DDC  
EDN1  
GBA  
GHRHR  
HYAL2  
IDE  
INPP5D  
LEP  
LRRK2  
MSH2  
MSH6  
NR5A1  
PRDM2  
RAD54B  
RAD54L  
RNF165  
SEC63  
TFCP2L1  
TH  
TREX1

ACD  
AGO1  
AGO3  
AGO4  
ANAPC1  
ANAPC10  
ANAPC11  
ANAPC15  
ANAPC16  
ANAPC2  
ANAPC4  
ANAPC5  
ANAPC7  
ASF1A  
CABIN1  
CBX2  
CBX4  
CBX6  
CBX8  
CCNA1  
CCNA2  
CCNE1  
CCNE2  
CDC16  
CDC23  
CDC26  
CDC27  
CDK2  
CDK4  
CDKN1B  
CDKN2C  
CEBPB  
CXCL8  
E2F2  
EED  
EHMT1  
EHMT2  
EP400  
ERF  
ETS1  
ETS2  
EZH2  
FOS  
H1-0  
H1-1  
H1-3  
H1-4  
H1-5  
H2AB1  
H2AC14  
H2AC18

H2AC19  
H2AC20  
H2AC4  
H2AC6  
H2AC7  
H2AC8  
H2AJ  
H2AZ1  
H2AZ2  
H2BC1  
H2BC10  
H2BC11  
H2BC12  
H2BC13  
H2BC14  
H2BC15  
H2BC17  
H2BC21  
H2BC3  
H2BC4  
H2BC5  
H2BC6  
H2BC7  
H2BC8  
H2BC9  
H2BS1  
H2BU1  
H3-3A  
H3-3B  
H3-4  
H3C1  
H3C10  
H3C11  
H3C12  
H3C13  
H3C14  
H3C15  
H3C2  
H3C3  
H3C4  
H3C6  
H3C7  
H3C8  
H4-16  
H4C1  
H4C11  
H4C12  
H4C13  
H4C14  
H4C15  
H4C2

H4C3  
H4C4  
H4C5  
H4C6  
H4C8  
H4C9  
HIRA  
IFNB1  
IL1A  
IL6  
JUN  
KAT5  
KDM6B  
LMNB1  
MAP2K4  
MAP2K6  
MAP2K7  
MAP3K5  
MAP4K4  
MAPK1  
MAPK10  
MAPK11  
MAPK3  
MAPK7  
MAPK8  
MAPK9  
MAPKAPK2  
MAPKAPK3  
MDM4  
MINK1  
MIR24-1  
MIR24-2  
MOV10  
MRE11  
NBN  
NFKB1  
PHC1  
PHC2  
PHC3  
POT1  
RAD50  
RBBP4  
RBBP7  
RELA  
RING1  
RNF2  
RPS27A  
RPS6KA1  
RPS6KA2  
RPS6KA3  
SCMH1

SP1  
STAT3  
SUZ12  
TERF2IP  
TFDP1  
TFDP2  
TINF2  
TNIK  
TNRC6A  
TNRC6B  
TNRC6C  
TXN  
UBA52  
UBB  
UBC  
UBE2C  
UBE2D1  
UBE2E1  
UBE2S  
UBN1  
VENTX  
ALDOC  
ENO1  
G6PD  
GAPDH  
HK1  
LDHA  
PGK1  
PKM  
PRKAA1  
AKT1S1  
AMBRA1  
ATG10  
ATG12  
ATG13  
ATG14  
ATG16L1  
ATG3  
ATG5  
ATG7  
BECN1  
BMP2  
BRAF  
CCL3  
COL10A1  
CXCL1  
FKBP8  
GABARAP  
GABARAPL1  
GABARAPL2  
GSK3B

IGF1  
IL1B  
IL24  
IL3  
IL6R  
IL6ST  
INHBA  
INS  
IRF1  
KMT2A  
LAMP1  
LAMP2  
MAP1LC3A  
MAP1LC3C  
MIR29B2  
MIR29C  
MIR3606  
MLST8  
MMP14  
PCNA  
PIK3C3  
PLAT  
PLAU  
RAF1  
RB1CC1  
RNASEL  
SH3GLB1  
SLC39A1  
SLC39A2  
SLC39A3  
SLC39A4  
SMAD3  
SMAD4  
SQSTM1  
SRC  
TGFB1  
TNFSF15  
ULK1  
UVRAG  
VTN  
FH  
GOT1  
MDH1  
ME1  
ME2  
PDHA1  
PDK1  
PDP2  
AADAT  
ACMSD  
AFMID

