

Supplementary Table 1. 386 SG-related genes from GeneCards

Gene.Symbol	Description	Category	Uniprot.ID	Relevance.s core
G3BP1	G3BP Stress Granule Assembly Factor 1	Protein Coding	Q13283	42.8107757 568359
G3BP2	G3BP Stress Granule Assembly Factor 2	Protein Coding	Q9UN86	40.1385993 95752
CAPRIN1	Cell Cycle Associated Protein 1	Protein Coding	Q14444	14.3172550 201416
UBAP2L	Ubiquitin Associated Protein 2 Like	Protein Coding	Q14157	13.9114971 160889
C9orf72	C9orf72-SMCR8 Complex Subunit	Protein Coding	Q96LT7	11.3250350 952148
ZFAND1	Zinc Finger AN1-Type Containing 1	Protein Coding	Q8TCF1	10.4504175 186157
OGFOD1	2-Oxoglutarate And Iron Dependent Oxygenase Domain Containing 1	Protein Coding	Q8N543	10.2213344 573975
DDX3X	DEAD-Box Helicase 3 X-Linked	Protein Coding	O00571	10.1791610 717773
TIA1	TIA1 Cytotoxic Granule Associated RNA Binding Protein	Protein Coding	P31483	10.0465860 366821
DYRK3	Dual Specificity Tyrosine Phosphorylation Regulated Kinase 3	Protein Coding	O43781	9.80235099 79248
YTHDF1	YTH N6-Methyladenosine RNA Binding Protein F1	Protein Coding	Q9BYJ9	9.28467559 814453
FMR1	Fragile X Messenger Ribonucleoprotein 1	Protein Coding	Q06787	8.98607540 130615
TRIM21	Tripartite Motif Containing 21	Protein Coding	P19474	8.60279273 986816
EIF4A1	Eukaryotic Translation Initiation Factor 4A1	Protein Coding	P60842	8.16855144 500732
EIF3B	Eukaryotic Translation Initiation Factor 3 Subunit B	Protein Coding	P55884	8.00216293 334961
EIF2S1	Eukaryotic Translation Initiation Factor 2 Subunit Alpha	Protein Coding	P05198	7.79791736 602783
VCP	Valosin Containing Protein	Protein Coding	P55072	7.58768224 716187
ENDOV	Endonuclease V	Protein Coding	Q8N8Q3	7.51409339 904785
TARDBP	TAR DNA Binding Protein	Protein Coding	Q13148	7.51104450 22583
PABPC1	Poly(A) Binding Protein Cytoplasmic 1	Protein Coding	P11940	7.49073982 23877

NUFIP2	Nuclear FMR1 Interacting Protein 2	Protein Coding	Q7Z417	7.45497131347656
DAZAP2	DAZ Associated Protein 2	Protein Coding	Q15038	7.43723726272583
MCRIP1	MAPK Regulated Corepressor Interacting Protein 1	Protein Coding	C9JLW8	7.38232469558716
MCRIP2	MAPK Regulated Corepressor Interacting Protein 2	Protein Coding	Q9BUT9	7.38232469558716
FAF2	Fas Associated Factor Family Member 2	Protein Coding	Q96CS3	7.30536317825317
ZNFX1	Zinc Finger NFX1-Type Containing 1	Protein Coding	Q9P2E3	7.2906665802002
STYXL1	Serine/Threonine/Tyrosine Interacting Like 1	Protein Coding	Q9Y6J8	7.27029705047607
SPATS2L	Spermatogenesis Associated Serine Rich 2 Like	Protein Coding	Q9NUQ6	7.26905345916748
GRB7	Growth Factor Receptor Bound Protein 7	Protein Coding	Q14451	7.18402099609375
USP10	Ubiquitin Specific Peptidase 10	Protein Coding	Q14694	7.10333156585693
TRIM25	Tripartite Motif Containing 25	Protein Coding	Q14258	7.02136468887329
CSDE1	Cold Shock Domain Containing E1	Protein Coding	O75534	7.0099983215332
PRRC2C	Proline Rich Coiled-Coil 2C	Protein Coding	Q9Y520	6.97580671310425
EIF4G1	Eukaryotic Translation Initiation Factor 4 Gamma 1	Protein Coding	Q04637	6.76502799987793
EIF2AK2	Eukaryotic Translation Initiation Factor 2 Alpha Kinase 2	Protein Coding	P19525	6.38723087310791
YTHDF2	YTH N6-Methyladenosine RNA Binding Protein F2	Protein Coding	Q9Y5A9	6.33724403381348
YBX1	Y-Box Binding Protein 1	Protein Coding	P67809	6.33535861968994
YTHDF3	YTH N6-Methyladenosine RNA Binding Protein F3	Protein Coding	Q7Z739	6.27071285247803
ANG	Angiogenin	Protein Coding	P03950	6.10561943054199
LSM14A	LSM14A MRNA Processing Body Assembly Factor	Protein Coding	Q8ND56	6.06728935241699
FXR1	FMR1 Autosomal Homolog 1	Protein Coding	P51114	6.03306293487549
ZFP36	ZFP36 Ring Finger Protein	Protein Coding	P26651	6.01155710220337

LARP1	La Ribonucleoprotein 1, Translational Regulator	Protein Coding	Q6PKG0	5.85036611 557007
DHX9	DExH-Box Helicase 9	Protein Coding	Q08211	5.84460639 953613
LARP4	La Ribonucleoprotein 4	Protein Coding	Q71RC2	5.84403133 392334
IGF2BP1	Insulin Like Growth Factor 2 MRNA Binding Protein 1	Protein Coding	Q9NZI8	5.71866321 563721
DDX6	DEAD-Box Helicase 6	Protein Coding	P26196	5.67455196 380615
DDX1	DEAD-Box Helicase 1	Protein Coding	Q92499	5.67455196 380615
ATXN2L	Ataxin 2 Like	Protein Coding	Q8WWM7	5.63923072 814941
QKI	QKI, KH Domain Containing RNA Binding	Protein Coding	Q96PU8	5.47132301 330566
EIF4E	Eukaryotic Translation Initiation Factor 4E	Protein Coding	P06730	5.45201730 728149
HABP4	Hyaluronan Binding Protein 4	Protein Coding	Q5JVS0	5.39841651 916504
IGF2BP3	Insulin Like Growth Factor 2 MRNA Binding Protein 3	Protein Coding	O00425	5.35427570 343018
IGF2BP2	Insulin Like Growth Factor 2 MRNA Binding Protein 2	Protein Coding	Q9Y6M1	5.25698566 436768
ELAVL1	ELAV Like RNA Binding Protein 1	Protein Coding	Q15717	5.22058105 46875
DHX36	DEAH-Box Helicase 36	Protein Coding	Q9H2U1	5.05693387 985229
CASC3	CASC3 Exon Junction Complex Subunit	Protein Coding	O15234	4.89260768 890381
PABPC4L	Poly(A) Binding Protein Cytoplasmic 4 Like	Protein Coding	P0CB38	4.62240982 055664
ATXN2	Ataxin 2	Protein Coding	Q99700	4.58679389 953613
FXR2	FMR1 Autosomal Homolog 2	Protein Coding	P51116	4.54995107 650757
MOV10	Mov10 RNA Helicase	Protein Coding	Q9HCE1	4.52796936 035156
TIAL1	TIA1 Cytotoxic Granule Associated RNA Binding Protein Like 1	Protein Coding	Q01085	4.52796936 035156
HDAC6	Histone Deacetylase 6	Protein Coding	Q9UBN7	4.50925254 821777
USP5	Ubiquitin Specific Peptidase 5	Protein Coding	P45974	4.44632577 896118

FUS	FUS RNA Binding Protein	Protein Coding	P35637	4.39070510 864258
NXF1	Nuclear RNA Export Factor 1	Protein Coding	Q9UBU9	4.28254270 553589
HNRNPK	Heterogeneous Nuclear Ribonucleoprotein K	Protein Coding	P61978	4.26567840 576172
PABPC4	Poly(A) Binding Protein Cytoplasmic 4	Protein Coding	Q13310	4.26567840 576172
PKP1	Plakophilin 1	Protein Coding	Q13835	4.24184417 724609
SSB	Small RNA Binding Exonuclease Protection Factor La	Protein Coding	P05455	4.23843097 686768
ZC3H12A	Zinc Finger CCCH-Type Containing 12A	Protein Coding	Q5D1E8	4.17631101 608276
PRKAA2	Protein Kinase AMP-Activated Catalytic Subunit Alpha 2	Protein Coding	P54646	4.15588474 273682
PQBP1	Polyglutamine Binding Protein 1	Protein Coding	O60828	4.02764892 578125
KPNB1	Karyopherin Subunit Beta 1	Protein Coding	Q14974	3.93262529 373169
STAU1	Staufen Double-Stranded RNA Binding Protein 1	Protein Coding	O95793	3.93262529 373169
KHSRP	KH-Type Splicing Regulatory Protein	Protein Coding	Q92945	3.91731572 151184
MAPT	Microtubule Associated Protein Tau	Protein Coding	P10636	3.91541266 441345
PRMT1	Protein Arginine Methyltransferase 1	Protein Coding	Q99873	3.84478163 719177
CELF1	CUGBP Elav-Like Family Member 1	Protein Coding	Q92879	3.82291674 613953
RPS23	Ribosomal Protein S23	Protein Coding	P62266	3.75031971 931458
PRKRA	Protein Activator Of Interferon Induced Protein Kinase EIF2AK2	Protein Coding	O75569	3.66990303 993225
DERA	Deoxyribose-Phosphate Aldolase	Protein Coding	Q9Y315	3.59456396 102905
HNRNPA1	Heterogeneous Nuclear Ribonucleoprotein A1	Protein Coding	P09651	3.55320310 592651
PRKAA1	Protein Kinase AMP-Activated Catalytic Subunit Alpha 1	Protein Coding	Q13131	3.55103468 894958
CSNK2A1	Casein Kinase 2 Alpha 1	Protein Coding	P68400	3.52244424 819946
HNRNPU	Heterogeneous Nuclear Ribonucleoprotein U	Protein Coding	Q00839	3.52244424 819946

RPL4	Ribosomal Protein L4	Protein Coding	P36578	3.49010467 529297
PUM2	Pumilio RNA Binding Family Member 2	Protein Coding	Q8TB72	3.45608925 819397
HSPA5	Heat Shock Protein Family A (Hsp70) Member 5	Protein Coding	P11021	3.45591282 844543
SERBP1	SERPINE1 mRNA Binding Protein 1	Protein Coding	Q8NC51	3.45591282 844543
DCP1A	Decapping MRNA 1A	Protein Coding	Q9NPI6	3.44799828 529358
DYNC1H1	Dynein Cytoplasmic 1 Heavy Chain 1	Protein Coding	Q14204	3.40546655 654907
STAU2	Staufen Double-Stranded RNA Binding Protein 2	Protein Coding	Q9NUL3	3.38848733 901978
HSPA9	Heat Shock Protein Family A (Hsp70) Member 9	Protein Coding	P38646	3.35726833 343506
PARP12	Poly(ADP-Ribose) Polymerase Family Member 12	Protein Coding	Q9H0J9	3.33641767 501831
BECN1	Beclin 1	Protein Coding	Q14457	3.30502367 019653
EIF3A	Eukaryotic Translation Initiation Factor 3 Subunit A	Protein Coding	Q14152	3.29968976 974487
HNRNPR	Heterogeneous Nuclear Ribonucleoprotein R	Protein Coding	O43390	3.29968976 974487
SYNCRIP	Synaptotagmin Binding Cytoplasmic RNA Interacting Protein	Protein Coding	O60506	3.29968976 974487
EWSR1	EWS RNA Binding Protein 1	Protein Coding	Q01844	3.29081988 334656
HSPD1	Heat Shock Protein Family D (Hsp60) Member 1	Protein Coding	P10809	3.26893067 359924
TCP1	T-Complex 1	Protein Coding	P17987	3.26893067 359924
CCT3	Chaperonin Containing TCP1 Subunit 3	Protein Coding	P49368	3.26893067 359924
CCT6A	Chaperonin Containing TCP1 Subunit 6A	Protein Coding	P40227	3.26893067 359924
HSPA8	Heat Shock Protein Family A (Hsp70) Member 8	Protein Coding	P11142	3.23659133 911133
HNRNPA2B1	Heterogeneous Nuclear Ribonucleoprotein A2/B1	Protein Coding	P22626	3.23659133 911133
EIF2S2	Eukaryotic Translation Initiation Factor 2 Subunit Beta	Protein Coding	P20042	3.23659133 911133
CIRBP	Cold Inducible RNA Binding Protein	Protein Coding	Q14011	3.20975971 221924

ANXA11	Annexin A11	Protein Coding	P50995	3.20239925 384521
EIF4B	Eukaryotic Translation Initiation Factor 4B	Protein Coding	P23588	3.20239925 384521
RPL7A	Ribosomal Protein L7a	Protein Coding	P62424	3.20239925 384521
EIF4G2	Eukaryotic Translation Initiation Factor 4 Gamma 2	Protein Coding	P78344	3.20239925 384521
TDRD3	Tudor Domain Containing 3	Protein Coding	Q9H7E2	3.17408132 553101
HSPA1A	Heat Shock Protein Family A (Hsp70) Member 1A	Protein Coding	P0DMV8	3.16599488 258362
CCT5	Chaperonin Containing TCP1 Subunit 5	Protein Coding	P48643	3.16599488 258362
EIF3F	Eukaryotic Translation Initiation Factor 3 Subunit F	Protein Coding	O00303	3.16599488 258362
RPS3	Ribosomal Protein S3	Protein Coding	P23396	3.16599488 258362
XRCC6	X-Ray Repair Cross Complementing 6	Protein Coding	P12956	3.12688279 151917
HNRNPC	Heterogeneous Nuclear Ribonucleoprotein C	Protein Coding	P07910	3.12688279 151917
RACK1	Receptor For Activated C Kinase 1	Protein Coding	P63244	3.12688279 151917
HNRNPM	Heterogeneous Nuclear Ribonucleoprotein M	Protein Coding	P52272	3.12688279 151917
EIF3G	Eukaryotic Translation Initiation Factor 3 Subunit G	Protein Coding	O75821	3.12688279 151917
ZC3H12D	Zinc Finger CCCH-Type Containing 12D	Protein Coding	A2A288	3.11406135 559082
EEF2	Eukaryotic Translation Elongation Factor 2	Protein Coding	P13639	3.08435106 277466
RPLP0	Ribosomal Protein Lateral Stalk Subunit P0	Protein Coding	P05388	3.08435106 277466
H1-2	H1.2 Linker Histone, Cluster Member	Protein Coding	P16403	3.08435106 277466
DDX21	DExD-Box Helicase 21	Protein Coding	Q9NR30	3.08367848 396301
HIPK2	Homeodomain Interacting Protein Kinase 2	Protein Coding	Q9H2X6	3.05458617 210388
LIN28A	Lin-28 Homolog A	Protein Coding	Q9H9Z2	3.05458617 210388
RBPM5	RNA Binding Protein, MRNA Processing Factor	Protein Coding	Q93062	3.05458617 210388

RNF135	Ring Finger Protein 135	Protein Coding	Q8IUD6	3.05458617 210388
NANOS3	Nanos C2HC-Type Zinc Finger 3	Protein Coding	P60323	3.05458617 210388
RBPM52	RNA Binding Protein, MRNA Processing Factor 2	Protein Coding	Q6ZRY4	3.05458617 210388
RPN1	Ribophorin I	Protein Coding	P04843	3.03730630 874634
RPL23	Ribosomal Protein L23	Protein Coding	P62829	3.03730630 874634
ZFP36L1	ZFP36 Ring Finger Protein Like 1	Protein Coding	Q07352	3.03090119 361877
PRR5L	Proline Rich 5 Like	Protein Coding	Q6MZQ0	3.03090119 361877
PFN1	Profilin 1	Protein Coding	P07737	3.02836585 044861
DIPK1C	Divergent Protein Kinase Domain 1C	Protein Coding	Q0P6D2	3.02836585 044861
HSF1	Heat Shock Transcription Factor 1	Protein Coding	Q00613	3.01047468 185425
HSP90AA1	Heat Shock Protein 90 Alpha Family Class A Member 1	Protein Coding	P07900	2.99897599 220276
KPNA2	Karyopherin Subunit Alpha 2	Protein Coding	P52292	2.99897599 220276
FAM98A	Family With Sequence Similarity 98 Member A	Protein Coding	Q8NCA5	2.99897599 220276
KHDRBS1	KH RNA Binding Domain Containing, Signal Transduction Associated 1	Protein Coding	Q07666	2.98390817 642212
PES1	Pescadillo Ribosomal Biogenesis Factor 1	Protein Coding	O00541	2.98390817 642212
LMNA	Lamin A/C	Protein Coding	P02545	2.96821689 605713
DSP	Desmoplakin	Protein Coding	P15924	2.96821689 605713
CDK1	Cyclin Dependent Kinase 1	Protein Coding	P06493	2.96821689 605713
HSPA4	Heat Shock Protein Family A (Hsp70) Member 4	Protein Coding	P34932	2.96821689 605713
KLC1	Kinesin Light Chain 1	Protein Coding	Q07866	2.95985221 862793
BICD1	BICD Cargo Adaptor 1	Protein Coding	Q96G01	2.95985221 862793
ROCK1	Rho Associated Coiled-Coil Containing Protein Kinase 1	Protein Coding	Q13464	2.94287276 268005

DDX19B	DEAD-Box Helicase 19B	Protein Coding	Q9UMR2	2.94287276 268005
MTHFD1	Methylenetetrahydrofolate Dehydrogenase, Cyclohydrolase And Formyltetrahydrofolate Synthetase 1	Protein Coding	P11586	2.93587732 315063
TXN	Thioredoxin	Protein Coding	P10599	2.93587732 315063
MARS1	Methionyl-TRNA Synthetase 1	Protein Coding	P56192	2.93587732 315063
SRP68	Signal Recognition Particle 68	Protein Coding	Q9UHB9	2.92056798 934937
CSNK2B	Casein Kinase 2 Beta	Protein Coding	P67870	2.90168571 472168
PRMT5	Protein Arginine Methyltransferase 5	Protein Coding	O14744	2.90168571 472168
RIGI	RNA Sensor RIG-I	Protein Coding	O95786	2.90168571 472168
ATP5F1A	ATP Synthase F1 Subunit Alpha	Protein Coding	P25705	2.90168571 472168
MCM7	Minichromosome Maintenance Complex Component 7	Protein Coding	P33993	2.90168571 472168
PSMD2	Proteasome 26S Subunit Ubiquitin Receptor, Non-ATPase 2	Protein Coding	Q13200	2.90168571 472168
YARS1	Tyrosyl-TRNA Synthetase 1	Protein Coding	P54577	2.90168571 472168
CSE1L	Chromosome Segregation 1 Like	Protein Coding	P55060	2.90168571 472168
ATAD3A	ATPase Family AAA Domain Containing 3A	Protein Coding	Q9NVI7	2.90168571 472168
EIF3E	Eukaryotic Translation Initiation Factor 3 Subunit E	Protein Coding	P60228	2.90168571 472168
HNRNPA3	Heterogeneous Nuclear Ribonucleoprotein A3	Protein Coding	P51991	2.90168571 472168
ILF3	Interleukin Enhancer Binding Factor 3	Protein Coding	Q12906	2.90168571 472168
RTCB	RNA 2',3'-Cyclic Phosphate And 5'-OH Ligase	Protein Coding	Q9Y3I0	2.90168571 472168
H1-10	H1.10 Linker Histone	Protein Coding	Q92522	2.90168571 472168
PKM	Pyruvate Kinase M1/2	Protein Coding	P14618	2.86528110 50415
VIM	Vimentin	Protein Coding	P08670	2.86528110 50415

FLNA	Filamin A	Protein Coding	P21333	2.86528110 50415
NCL	Nucleolin	Protein Coding	P19338	2.86528110 50415
RPL15	Ribosomal Protein L15	Protein Coding	P61313	2.86528110 50415
RPS6	Ribosomal Protein S6	Protein Coding	P62753	2.86528110 50415
RPL3	Ribosomal Protein L3	Protein Coding	P39023	2.86528110 50415
SRSF3	Serine And Arginine Rich Splicing Factor 3	Protein Coding	P84103	2.86528110 50415
RPL27A	Ribosomal Protein L27a	Protein Coding	P46776	2.86528110 50415
RSL1D1	Ribosomal L1 Domain Containing 1	Protein Coding	O76021	2.86528110 50415
EIF3L	Eukaryotic Translation Initiation Factor 3 Subunit L	Protein Coding	Q9Y262	2.86528110 50415
RBFOX1	RNA Binding Fox-1 Homolog 1	Protein Coding	Q9NWB1	2.85522866 249084
MAPKAPK2	MAPK Activated Protein Kinase 2	Protein Coding	P49137	2.83802151 679993
DDX39A	DEAD-Box Helicase 39A	Protein Coding	O00148	2.83802151 679993
DSC1	Desmocollin 1	Protein Coding	Q08554	2.83802151 679993
NPM1	Nucleophosmin 1	Protein Coding	P06748	2.82616901 397705
ENO1	Enolase 1	Protein Coding	P06733	2.82616901 397705
IMPDH2	Inosine Monophosphate Dehydrogenase 2	Protein Coding	P12268	2.82616901 397705
LBR	Lamin B Receptor	Protein Coding	Q14739	2.82616901 397705
ALDH18A1	Aldehyde Dehydrogenase 18 Family Member A1	Protein Coding	P54886	2.82616901 397705
TUBA1B	Tubulin Alpha 1b	Protein Coding	P68363	2.82616901 397705
TUBB4B	Tubulin Beta 4B Class IVb	Protein Coding	P68371	2.82616901 397705
RPS14	Ribosomal Protein S14	Protein Coding	P62263	2.82616901 397705
CCT2	Chaperonin Containing TCP1 Subunit 2	Protein Coding	P78371	2.82616901 397705

RFC4	Replication Factor C Subunit 4	Protein Coding	P35249	2.82616901397705
RPS7	Ribosomal Protein S7	Protein Coding	P62081	2.82616901397705
DDX17	DEAD-Box Helicase 17	Protein Coding	Q92841	2.82616901397705
GSDMD	Gasdermin D	Protein Coding	P57764	2.82616901397705
RBMX	RNA Binding Motif Protein X-Linked	Protein Coding	P38159	2.82616901397705
RPL13	Ribosomal Protein L13	Protein Coding	P26373	2.82616901397705
RPL23A	Ribosomal Protein L23a	Protein Coding	P62750	2.82616901397705
YBX3	Y-Box Binding Protein 3	Protein Coding	P16989	2.82616901397705
EEF1G	Eukaryotic Translation Elongation Factor 1 Gamma	Protein Coding	P26641	2.82616901397705
FAM120A	Family With Sequence Similarity 120 Member A	Protein Coding	Q9NZB2	2.82616901397705
RPS18	Ribosomal Protein S18	Protein Coding	P62269	2.82616901397705
FUBP3	Far Upstream Element Binding Protein 3	Protein Coding	Q96I24	2.82616901397705
DHX30	DExH-Box Helicase 30	Protein Coding	Q7L2E3	2.79161930084229
GAPDH	Glyceraldehyde-3-Phosphate Dehydrogenase	Protein Coding	P04406	2.78363728523254
HSP90AB1	Heat Shock Protein 90 Alpha Family Class B Member 1	Protein Coding	P08238	2.78363728523254
PRKDC	Protein Kinase, DNA-Activated, Catalytic Subunit	Protein Coding	P78527	2.78363728523254
PHGDH	Phosphoglycerate Dehydrogenase	Protein Coding	O43175	2.78363728523254
TUBB	Tubulin Beta Class I	Protein Coding	P07437	2.78363728523254
MYH9	Myosin Heavy Chain 9	Protein Coding	P35579	2.78363728523254
YWHAQ	Tyrosine 3-Monooxygenase/Tryptophan 5-Monooxygenase Activation Protein Theta	Protein Coding	P27348	2.78363728523254
CSNK2A2	Casein Kinase 2 Alpha 2	Protein Coding	P19784	2.78363728523254

MATR3	Matrin 3	Protein Coding	P43243	2.78363728 523254
RPL18	Ribosomal Protein L18	Protein Coding	Q07020	2.78363728 523254
PCBP2	Poly(RC) Binding Protein 2	Protein Coding	Q15366	2.78363728 523254
CCT8	Chaperonin Containing TCP1 Subunit 8	Protein Coding	P50990	2.78363728 523254
GLE1	GLE1 RNA Export Mediator	Protein Coding	Q53GS7	2.78363728 523254
SRSF4	Serine And Arginine Rich Splicing Factor 4	Protein Coding	Q08170	2.78363728 523254
DYRK1A	Dual Specificity Tyrosine Phosphorylation Regulated Kinase 1A	Protein Coding	Q13627	2.73659253 120422
ATP1A1	ATPase Na ⁺ /K ⁺ Transporting Subunit Alpha 1	Protein Coding	P05023	2.73659253 120422
TUBA1A	Tubulin Alpha 1a	Protein Coding	Q71U36	2.73659253 120422
JUP	Junction Plakoglobin	Protein Coding	P14923	2.73659253 120422
PPIA	Peptidylprolyl Isomerase A	Protein Coding	P62937	2.73659253 120422
ATP5F1B	ATP Synthase F1 Subunit Beta	Protein Coding	P06576	2.73659253 120422
C1QBP	Complement C1q Binding Protein	Protein Coding	Q07021	2.73659253 120422
TRAP1	TNF Receptor Associated Protein 1	Protein Coding	Q12931	2.73659253 120422
XRCC5	X-Ray Repair Cross Complementing 5	Protein Coding	P13010	2.73659253 120422
EPRS1	Glutamyl-Prolyl-TRNA Synthetase 1	Protein Coding	P07814	2.73659253 120422
LDHB	Lactate Dehydrogenase B	Protein Coding	P07195	2.73659253 120422
PSMC1	Proteasome 26S Subunit, ATPase 1	Protein Coding	P62191	2.73659253 120422
SLC3A2	Solute Carrier Family 3 Member 2	Protein Coding	P08195	2.73659253 120422
MCM6	Minichromosome Maintenance Complex Component 6	Protein Coding	Q14566	2.73659253 120422
NOP56	NOP56 Ribonucleoprotein	Protein Coding	O00567	2.73659253 120422
PSMC5	Proteasome 26S Subunit, ATPase 5	Protein Coding	P62195	2.73659253 120422

SLC25A5	Solute Carrier Family 25 Member 5	Protein Coding	P05141	2.73659253 120422
UBQLN2	Ubiquilin 2	Protein Coding	Q9UHD9	2.73659253 120422
CCT7	Chaperonin Containing TCP1 Subunit 7	Protein Coding	Q99832	2.73659253 120422
RPS5	Ribosomal Protein S5	Protein Coding	P46782	2.73659253 120422
CCT4	Chaperonin Containing TCP1 Subunit 4	Protein Coding	P50991	2.73659253 120422
TIMM50	Translocase Of Inner Mitochondrial Membrane 50	Protein Coding	Q3ZCQ8	2.73659253 120422
NACA	Nascent Polypeptide Associated Complex Subunit Alpha	Protein Coding	E9PAV3	2.73659253 120422
GCN1	GCN1 Activator Of EIF2AK4	Protein Coding	Q92616	2.73659253 120422
ATP2A2	ATPase Sarcoplasmic/Endoplasmic Reticulum Ca ²⁺ Transporting 2	Protein Coding	P16615	2.68319439 9
TFRC	Transferrin Receptor	Protein Coding	P02786	2.68319439 9
OAT	Ornithine Aminotransferase	Protein Coding	P04181	2.68319439 9
EIF4EBP1	Eukaryotic Translation Initiation Factor 4E Binding Protein 1	Protein Coding	Q13541	2.68319439 9
PDHB	Pyruvate Dehydrogenase E1 Subunit Beta	Protein Coding	P11177	2.68319439 9
CANX	Calnexin	Protein Coding	P27824	2.68319439 9
CHD4	Chromodomain Helicase DNA Binding Protein 4	Protein Coding	Q14839	2.68319439 9
EIF2S3	Eukaryotic Translation Initiation Factor 2 Subunit Gamma	Protein Coding	P41091	2.68319439 9
IARS1	Isoleucyl-TRNA Synthetase 1	Protein Coding	P41252	2.68319439 9
RUVBL2	RuvB Like AAA ATPase 2	Protein Coding	Q9Y230	2.68319439 9
SF3B1	Splicing Factor 3b Subunit 1	Protein Coding	O75533	2.68319439 9
PHB2	Prohibitin 2	Protein Coding	Q99623	2.68319439 9
PSMD7	Proteasome 26S Subunit, Non-ATPase 7	Protein Coding	P51665	2.68319439 9
HNRNPD	Heterogeneous Nuclear Ribonucleoprotein D	Protein Coding	Q14103	2.68319439 9

SLC25A11	Solute Carrier Family 25 Member 11	Protein Coding	Q02978	2.68319439 9
TUBB6	Tubulin Beta 6 Class V	Protein Coding	Q9BUF5	2.68319439 9
LRPPRC	Leucine Rich Pentatricopeptide Repeat Containing	Protein Coding	P42704	2.68319439 9
PSMC2	Proteasome 26S Subunit, ATPase 2	Protein Coding	P35998	2.68319439 9
TAF15	TATA-Box Binding Protein Associated Factor 15	Protein Coding	Q92804	2.68319439 9
GTF2I	General Transcription Factor Iii	Protein Coding	P78347	2.68319439 9
PSMD11	Proteasome 26S Subunit, Non-ATPase 11	Protein Coding	O00231	2.68319439 9
SLC25A6	Solute Carrier Family 25 Member 6	Protein Coding	P12236	2.68319439 9
DDX18	DEAD-Box Helicase 18	Protein Coding	Q9NVP1	2.68319439 9
ESYT1	Extended Synaptotagmin 1	Protein Coding	Q9BSJ8	2.68319439 9
ILF2	Interleukin Enhancer Binding Factor 2	Protein Coding	Q12905	2.68319439 9
ABCF2	ATP Binding Cassette Subfamily F Member 2	Protein Coding	Q9UG63	2.63873672 485352
YWHAE	Tyrosine 3-Monooxygenase/Tryptophan 5-Monooxygenase Activation Protein Epsilon	Protein Coding	P62258	2.61985421 180725
SDHA	Succinate Dehydrogenase Complex Flavoprotein Subunit A	Protein Coding	P31040	2.61985421 180725
RPL11	Ribosomal Protein L11	Protein Coding	P62913	2.61985421 180725
YWHAG	Tyrosine 3-Monooxygenase/Tryptophan 5-Monooxygenase Activation Protein Gamma	Protein Coding	P61981	2.61985421 180725
CTPS1	CTP Synthase 1	Protein Coding	P17812	2.61985421 180725
LMNB1	Lamin B1	Protein Coding	P20700	2.61985421 180725
SLC25A13	Solute Carrier Family 25 Member 13	Protein Coding	Q9UJS0	2.61985421 180725
CTTN	Cortactin	Protein Coding	Q14247	2.61985421 180725
NONO	Non-POU Domain Containing Octamer Binding	Protein Coding	Q15233	2.61985421 180725

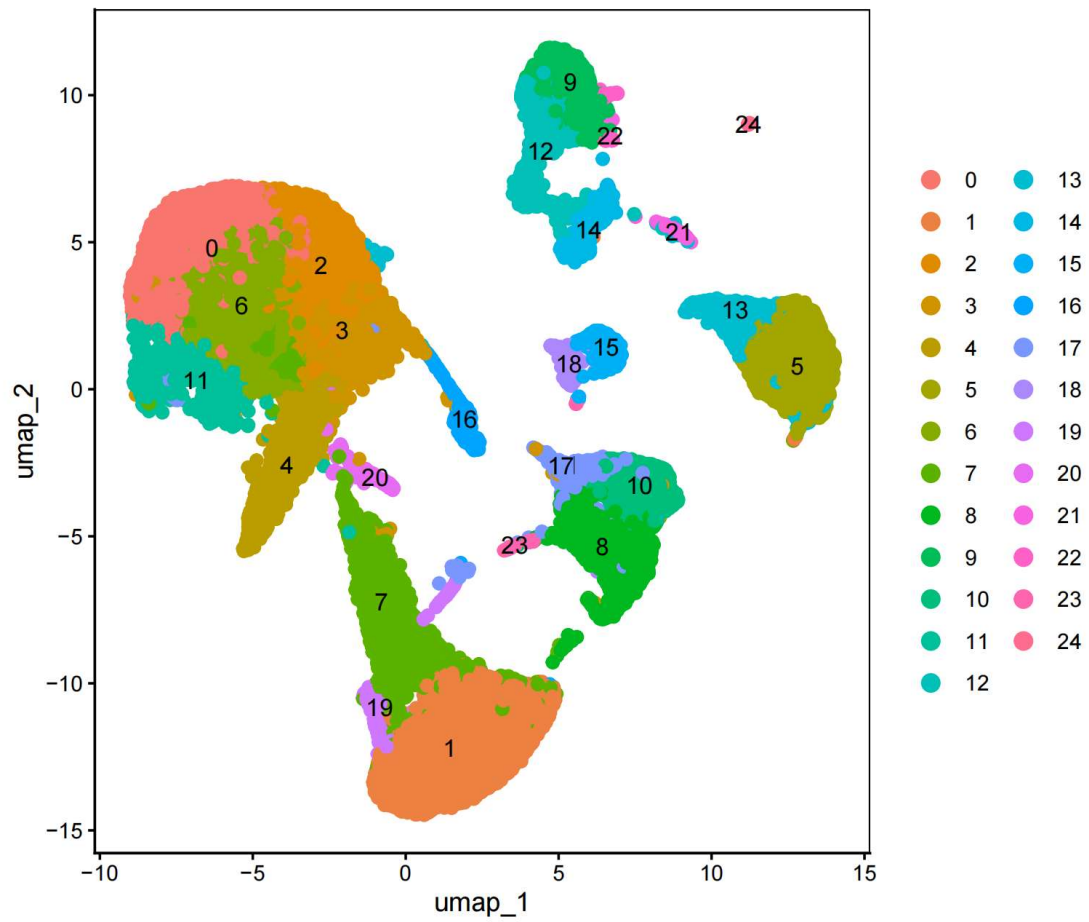
PSMD4	Proteasome 26S Subunit Ubiquitin Receptor, Non-ATPase 4	Protein Coding	P55036	2.61985421 180725
EIF4A3	Eukaryotic Translation Initiation Factor 4A3	Protein Coding	P38919	2.61985421 180725
RARS1	Arginyl-TRNA Synthetase 1	Protein Coding	P54136	2.61985421 180725
MTA2	Metastasis Associated 1 Family Member 2	Protein Coding	O94776	2.61985421 180725
DCTN2	Dynactin Subunit 2	Protein Coding	Q13561	2.61985421 180725
PSMD13	Proteasome 26S Subunit, Non-ATPase 13	Protein Coding	Q9UNM6	2.61985421 180725
RPL22	Ribosomal Protein L22	Protein Coding	P35268	2.61985421 180725
SRP72	Signal Recognition Particle 72	Protein Coding	O76094	2.61985421 180725
H4C1	H4 Clustered Histone 1	Protein Coding	P62805	2.61985421 180725
DDX54	DEAD-Box Helicase 54	Protein Coding	Q8TDD1	2.61985421 180725
MMS19	MMS19 Homolog, Cytosolic Iron-Sulfur Assembly Component	Protein Coding	Q96T76	2.61985421 180725
VAT1	Vesicle Amine Transport 1	Protein Coding	Q99536	2.61985421 180725
H1-3	H1.3 Linker Histone, Cluster Member	Protein Coding	P16402	2.61985421 180725
NASP	Nuclear Autoantigenic Sperm Protein	Protein Coding	P49321	2.61985421 180725
HNRNPH1	Heterogeneous Nuclear Ribonucleoprotein H1	Protein Coding	P31943	2.60707807 540894
MAPK8	Mitogen-Activated Protein Kinase 8	Protein Coding	P45983	2.57631921 768188
DKC1	Dyskerin Pseudouridine Synthase 1	Protein Coding	O60832	2.57631921 768188
TUFM	Tu Translation Elongation Factor, Mitochondrial	Protein Coding	P49411	2.57631921 768188
DNAJA1	DnaJ Heat Shock Protein Family (Hsp40) Member A1	Protein Coding	P31689	2.57631921 768188
RPL19	Ribosomal Protein L19	Protein Coding	P84098	2.57631921 768188
RPS3A	Ribosomal Protein S3A	Protein Coding	P61247	2.57631921 768188
ZC3HAV1	Zinc Finger CCCH-Type Containing, Antiviral 1	Protein Coding	Q7Z2W4	2.57631921 768188

CFL1	Cofilin 1	Protein Coding	P23528	2.54397964 477539
FBL	Fibrillarin	Protein Coding	P22087	2.54397964 477539
UPF1	UPF1 RNA Helicase And ATPase	Protein Coding	Q92900	2.54397964 477539
NUP205	Nucleoporin 205	Protein Coding	Q92621	2.54397964 477539
HNRNPUL1	Heterogeneous Nuclear Ribonucleoprotein U Like 1	Protein Coding	Q9BUJ2	2.54397964 477539
RPS8	Ribosomal Protein S8	Protein Coding	P62241	2.54397964 477539
IDH1	Isocitrate Dehydrogenase (NADP(+)) 1	Protein Coding	O75874	2.53730773 925781
GSK3A	Glycogen Synthase Kinase 3 Alpha	Protein Coding	P49840	2.53730773 925781
VKORC1	Vitamin K Epoxide Reductase Complex Subunit 1	Protein Coding	Q9BQB6	2.53730773 925781
CARM1	Coactivator Associated Arginine Methyltransferase 1	Protein Coding	Q86X55	2.53730773 925781
ACADM	Acyl-CoA Dehydrogenase Medium Chain	Protein Coding	P11310	2.53730773 925781
BUB3	BUB3 Mitotic Checkpoint Protein	Protein Coding	O43684	2.53730773 925781
HADHB	Hydroxyacyl-CoA Dehydrogenase Trifunctional Multienzyme Complex Subunit Beta	Protein Coding	P55084	2.53730773 925781
SPTLC1	Serine Palmitoyltransferase Long Chain Base Subunit 1	Protein Coding	O15269	2.53730773 925781
NSDHL	NAD(P) Dependent 3-Beta-Hydroxysteroid Dehydrogenase NSDHL	Protein Coding	Q15738	2.53730773 925781
NSF	N-Ethylmaleimide Sensitive Factor, Vesicle Fusing ATPase	Protein Coding	P46459	2.53730773 925781
IDH3A	Isocitrate Dehydrogenase (NAD(+)) 3 Catalytic Subunit Alpha	Protein Coding	P50213	2.53730773 925781
RPS27A	Ribosomal Protein S27a	Protein Coding	P62979	2.53730773 925781
MTHFD2	Methylenetetrahydrofolate Dehydrogenase (NADP+ Dependent) 2, Methenyltetrahydrofolate Cyclohydrolase	Protein Coding	P13995	2.53730773 925781
PAICS	Phosphoribosylaminoimidazole Carboxylase And	Protein Coding	P22234	2.53730773 925781

	Phosphoribosylaminoimidazolesuccinocarboxamide Synthase			
PPM1B	Protein Phosphatase, Mg ²⁺ /Mn ²⁺ Dependent 1B	Protein Coding	O75688	2.53730773 925781
PSMD3	Proteasome 26S Subunit, Non-ATPase 3	Protein Coding	O43242	2.53730773 925781
ACSL3	Acyl-CoA Synthetase Long Chain Family Member 3	Protein Coding	O95573	2.53730773 925781
SAE1	SUMO1 Activating Enzyme Subunit 1	Protein Coding	Q9UBE0	2.53730773 925781
EEF1D	Eukaryotic Translation Elongation Factor 1 Delta	Protein Coding	P29692	2.53730773 925781
PRMT6	Protein Arginine Methyltransferase 6	Protein Coding	Q96LA8	2.53730773 925781
TOR1AIP1	Torsin 1A Interacting Protein 1	Protein Coding	Q5JTV8	2.53730773 925781
PRMT8	Protein Arginine Methyltransferase 8	Protein Coding	Q9NR22	2.53730773 925781
COPG2	COPI Coat Complex Subunit Gamma 2	Protein Coding	Q9UBF2	2.53730773 925781
H2BC5	H2B Clustered Histone 5	Protein Coding	P58876	2.53730773 925781
CYP20A1	Cytochrome P450 Family 20 Subfamily A Member 1	Protein Coding	Q6UW02	2.53730773 925781
HNRNPUL2	Heterogeneous Nuclear Ribonucleoprotein U Like 2	Protein Coding	Q1KMD3	2.53730773 925781
FAM162A	Family With Sequence Similarity 162 Member A	Protein Coding	Q96A26	2.53730773 925781
PUM1	Pumilio RNA Binding Family Member 1	Protein Coding	Q14671	2.52400588 989258
PRDX1	Peroxiredoxin 1	Protein Coding	Q06830	2.50978779 792786
SQSTM1	Sequestosome 1	Protein Coding	Q13501	2.50978779 792786
ADAR	Adenosine Deaminase RNA Specific	Protein Coding	P55265	2.50978779 792786
PRDX6	Peroxiredoxin 6	Protein Coding	P30041	2.50978779 792786
PTGES3	Prostaglandin E Synthase 3	Protein Coding	Q15185	2.50978779 792786
RANBP1	RAN Binding Protein 1	Protein Coding	P43487	2.50978779 792786
STRAP	Serine/Threonine Kinase Receptor Associated Protein	Protein Coding	Q9Y3F4	2.50978779 792786

RNH1	Ribonuclease/Angiogenin Inhibitor 1	Protein Coding	P13489	2.50978779 792786
EIF3I	Eukaryotic Translation Initiation Factor 3 Subunit I	Protein Coding	Q13347	2.50978779 792786
H2AZ2	H2A.Z Variant Histone 2	Protein Coding	Q71UI9	2.50978779 792786
UBA1	Ubiquitin Like Modifier Activating Enzyme 1	Protein Coding	P22314	2.47338318 824768
ANXA1	Annexin A1	Protein Coding	P04083	2.47338318 824768
FLNB	Filamin B	Protein Coding	O75369	2.47338318 824768
MCM4	Minichromosome Maintenance Complex Component 4	Protein Coding	P33991	2.47338318 824768
PPP2R1A	Protein Phosphatase 2 Scaffold Subunit Aalpha	Protein Coding	P30153	2.47338318 824768
CDC73	Cell Division Cycle 73	Protein Coding	Q6P1J9	2.47338318 824768
EIF5A	Eukaryotic Translation Initiation Factor 5A	Protein Coding	P63241	2.47338318 824768
U2AF1	U2 Small Nuclear RNA Auxiliary Factor 1	Protein Coding	Q01081	2.47338318 824768
HSPA6	Heat Shock Protein Family A (Hsp70) Member 6	Protein Coding	P17066	2.47338318 824768
CPSF6	Cleavage And Polyadenylation Specific Factor 6	Protein Coding	Q16630	2.47338318 824768
RPS4X	Ribosomal Protein S4 X-Linked	Protein Coding	P62701	2.47338318 824768
HNRNPAB	Heterogeneous Nuclear Ribonucleoprotein A/B	Protein Coding	Q99729	2.47338318 824768
DDX50	DEAD-Box Helicase 50	Protein Coding	Q9BQ39	2.47338318 824768
MAGOHB	Mago Homolog B, Exon Junction Complex Subunit	Protein Coding	Q96A72	2.47338318 824768
CHORDC1	Cysteine And Histidine Rich Domain Containing 1	Protein Coding	Q9UHD1	2.47338318 824768
FTSJ3	FtsJ RNA 2'-O-Methyltransferase 3	Protein Coding	Q8IY81	2.47338318 824768
DDX19A	DEAD-Box Helicase 19A	Protein Coding	Q9NUU7	2.44236230 85022
FASN	Fatty Acid Synthase	Protein Coding	P49327	2.43427133 560181
TUBA4A	Tubulin Alpha 4a	Protein Coding	P68366	2.43427133 560181

YWHAB	Tyrosine 3-Monooxygenase/Tryptophan 5-Monooxygenase Activation Protein Beta	Protein Coding	P31946	2.43427133 560181
MCM5	Minichromosome Maintenance Complex Component 5	Protein Coding	P33992	2.43427133 560181
PURA	Purine Rich Element Binding Protein A	Protein Coding	Q00577	2.43427133 560181
ANXA6	Annexin A6	Protein Coding	P08133	2.43427133 560181
RBBP4	RB Binding Protein 4, Chromatin Remodeling Factor	Protein Coding	Q09028	2.43427133 560181
S100A9	S100 Calcium Binding Protein A9	Protein Coding	P06702	2.43427133 560181
SFPQ	Splicing Factor Proline And Glutamine Rich	Protein Coding	P23246	2.43427133 560181
NUDC	Nuclear Distribution C, Dynein Complex Regulator	Protein Coding	Q9Y266	2.43427133 560181
TUBA1C	Tubulin Alpha 1c	Protein Coding	Q9BQE3	2.43427133 560181
MAP4	Microtubule Associated Protein 4	Protein Coding	P27816	2.43427133 560181
IPO7	Importin 7	Protein Coding	O95373	2.43427133 560181
MAGED2	MAGE Family Member D2	Protein Coding	Q9UNF1	2.43427133 560181
ATAD2	ATPase Family AAA Domain Containing 2	Protein Coding	Q6PL18	2.43427133 560181
EIF3D	Eukaryotic Translation Initiation Factor 3 Subunit D	Protein Coding	O15371	2.43427133 560181
RBM26	RNA Binding Motif Protein 26	Protein Coding	Q5T8P6	2.43427133 560181
NOP58	NOP58 Ribonucleoprotein	Protein Coding	Q9Y2X3	2.43427133 560181
RPL24	Ribosomal Protein L24	Protein Coding	P83731	2.43427133 560181
PELO	Pelota mRNA Surveillance And Ribosome Rescue Factor	Protein Coding	Q9BRX2	2.43427133 560181
RTRAF	RNA Transcription, Translation And Transport Factor	Protein Coding	Q9Y224	2.43427133 560181
RBM4	RNA Binding Motif Protein 4	Protein Coding	Q9BWF3	2.39531755 447388



Supplementary Fig.1 Unannotated clustered UMAP plot of scRNA-seq data



Supplementary Fig.2 Heatmap of the top 5 highly expressed genes in each cell cluster