

Suppl. Figure 1

Overview graph table of overlapping differentially expressed genes (all regulated genes, FDR q-value: ≤ 0.05) between MGUS and SMM MSC (451), between MGUS and MM (209) and SMM and MM (253).

Suppl. Figure 2. Gene set enrichment analysis (GSEA) confirmed contributed cell processes in MGUS, SMM and MM MSC

Gene set enrichment analysis of a pairwise comparison between healthy and each of the different patient group (MGUS, SMM or MM) ~~Gene set enrichment analysis~~ confirmed a significant overlap of deregulated genes with those involved ~~strong enrichment~~ for cell processes such as hematopoiesis, cell status or osteogenesis in MGUS, SMM and MM MSC. For all plots, the normalized enrichment score (NES), p-values and false discovery rate (FDR q-value) are given.

Suppl. Figure 3. Gene set enrichment analysis (GSEA) of MGUS, SMM and MM MSC for the gene sets ribosomes, mitochondrial gene expression and apoptosis

(A) Waterfall plots from GSEA for the signatures ribosomes (GO_RIBOSOME) and mitochondrial gene expression (GO_MITOCHONDRIAL GENE EXPRESSION) for MGUS, SMM and MM MSC contrasted to healthy (HC) are given. For all plots, the normalized enrichment score (NES), p-values and false discovery rate (FDR q-value) are given.

(B) Waterfall plots from GSEA depicts enrichment signature for intrinsic- and extrinsic apoptotic signaling pathway for MGUS, SMM and MM MSC contrasted to healthy

(HC) are given. For all plots, the normalized enrichment score (NES), p-values and false discovery rate (FDR q-value) are given.

Suppl. Table 1

PDF table of unique differentially expressed genes in MGUS MSC (583, FDR q-value ≤ 0.05) within the comparison of all three MSC groups.

Suppl. Table 2

PDF table of unique differentially expressed genes in SMM MSC (513, FDR q-value ≤ 0.05) within the comparison of all three MSC groups.

Suppl. Table 3

PDF table of unique differentially expressed genes in MM MSC (3938, FDR q-value $p \leq 0.05$) within the comparison of all three MSC groups.

Supplemental Figures 1-3

Suppl. Figure 1

MGUS vs. SMM all regulated

HOXB7	HOXB6	UQCGRFS1P1	RMRP	SOC52	HTRA3	DSCC1	SEMA3D	FSCN1	DHCR7	PIP5K1L	FBR5	HSP90B3P	C12orf45	AC117409.1	SLC7A14	AKNA	FTH1
RPS3AP5	MOCOS	TBX15	RPL4P5	PIASA	LINC02328	GPM68	FRA51	NUDT11	SETD1A	TRHDE	C15orf40	WRB	NLRP1	AOC3	MTH1	PTMS	MT-TC
EEF1A1P5	RPS27A	RYL4	ELN	KDEL1R	LRFN4	NDFU11	TMEM158	GYPE	PMMP9	PR5D	MARCH4	PTGER4	PLH1	IL10RA	THAP1	NUDCD2	ZNF571-AS1
HOXB4	AGPAT1	ITGA5	ALDH3A2	RPL9	MBOAT7	AL122020.1	APOL3	ZBTB45	NYAP1	INTS1	CHST11	CLIP3	WDFY1	APH1B	MAP3K8	CEBPB	CD37
ALDOA	TNFRSF19	SETP14	HIC1	GRP78	EV15L	ANKRD1	PTPRD-AS1	HOCA-AS2	TMEM120B	PSAT1	RPS18	COTN8	MARC1	DCTPP1	LTGP2	MAP4K3-DT	TMEM148
SHOX2	MAP701	DOCK10	SPPRED3	PSMA1	MPPED2	EPN1	NPIPA5	SGCA	PDCD11G2	WDR24	TPB18	OTOF	AC004156.1	NEK11	SBB5	HCK	CRYL1
MAB21L2	PTPRF	DCLK2	NRXN3	ANOS2	OSR2	RPL5P34	COL9A2	MRPL15	DOP1B	EMC6	AC025164.1	NDFU81	FAM160A1	RAC2	ETV5	PCDH19	H5G5T1
MT-TY	SCRGI	AC006970.2	MHYH13	ANOS5	FADD	FBR5L1	NCOR2	RPS15A	ARHGDA1	ANKRD13A	TNNT3	LYPD6	ZNF664	LST1	TSC22D4	RAB9A	DKK2
ZNF703	SOX11	TPM1	FAM243B	NFIB	ZBTB18	SH3BP1	C4orf48	INHBA	SMIM7	PIGC	PPP1R18	TTYH3	HNRNP3AP6	TPSAN18	CTBP1	HDAC10	CHCHD1
AC027309.2	ALDH1B1	RPS3AP26	TAMP8	SOC52-AS1	FOXCUT	RPS23P8	FLI1	ZNF579	FZD8	CDC42EP3	EPH8	CELSR1	LINC01684	PIGB051	GAD7D3B	TRMT61B	TLR2
RPL18AP3	GNCS	SALL1	EEF1A1P19	ENPP2	PCED1B	CCNJL	AL161909.1	SAMD5	MYPPO	MARK4	TRABD	MFSD14A	OClAD1	PTGER1	EMX2	F10	MAIP1
FKBP1C	ZBTB7A	LINC00900	DPH5	MAZ	CD84	PRAG1	BDNF	P3H4	CCSAP	HEV2	LYN	MINK1	ALDH2	NF2	POU2F2	CD14	TMEM201
RAB51F	PCBP1	GALM	ZMYND15	RPS12	NR2F1-AS1	TRIM67	EEF1A1P6	AC099066.2	AC093890.1	S10P5	MSX2	AC04619.3	FOXC2	AC099560.2	AR5J	AP152	SF3A1
NR2F1	MTCO2P12	RPS11P5	ARHGAP1	RPL15P3	ZNF385D	MTCL1	FRMD5	LTBP3	HSP90B2P	SH3RF2	PHLDB1	TENM3-AS1	ARL14EP	GSK3A	CDK17	CDH15	SLOC2B1
AC016739.1	ADH5	RPL2P4	PARP9	STON2	TNS1	SGCG	CYP19A1	HOXA5	ENGASE	SLC44A3-AS1	TMEM258	CXCL16	MYL6P5	AL159918.1	TMED1	ITGAM	C15orf54
TFAP2A	MET	NACA	FAM189B	SERPINE1	MDH2	HSP61	MTCO1P40	RPL31	NCA21	PPP2R3C	SIRPB1	DLX4	NDNF	ARHGAP23	AP2A1	SLC40A1	C10A
HOXB3	PLPP4	MYH9	ZNF865	STRA6	MDIN	TATDN3	EN1	XPNPEP2	RPS2P46	OGFR1L	LINC01629	ADAMTS12	MARVELD2	DTWD1	SMDT1	PLA2G4	AK2A
TMSB4XP4	PAX9	HOXB5	ARRB1	TLES	PROS1	COX6A1	DCBLD1	FURIN	GSTA4	SRRM1	RPL21	LYPD6	FZD6	HADHB	DECR1	CKAP2	MAPK2
NPMP127	EHD2	RPS3A	ZNF628	TMSB10P1	LMO3	PTPRE	ADAMTS6	RPS7	HIKESHI	SUMO2P1	ATXN2	CLDN23	SNHG29	PLEKHG6	TMEM184B	AC020916.1	
TP1P1	PKR12	SKAP2	AC112523.1	SELENOP	INTX	TNXB	PAK4	HIP1R	OST4	ACAT1	GASK1B	ANGPTL1	IDNK	SERP2	WNT5B	KIAA1522	
IGFBP11	AKR1C2	E1F252P4	ZFPM1	NTRK2	PLSCR1	PLTP	LRFN3	DCH51	STGGAL2	SCCPDH	CITED4	CBARP	FRP3	SYNGR1	SS18L2	IAH1	
LDHB	IEBP	PARP15	PTMAP5	CALR	JTB	FASN	EPGN	ZNF282	RPLP0	ECM2	RAB3A	DUSP6	BAG6	AC067852.2	SCN9A	GET4	
COL15A1	EEF1A1P11	CACNA2D3	F0XMA1	PXMT1	ZC3H18	RAB11B	MMP24OS	PPIR19B	AC005912.1	CLCN4	LGALS3	PCID2	TEX41	GUSB	SARMC5A-AS1	FN1	
MTCO1P12	CDH2	HSP90A2P	LYPD1	RPL3P4	EMB	HMOX1	TBP1L	RPL14P1	ABCA13	CE51	CCDC85C	DDAH1	LAMTOR4	SP11	TPG51	ZNF771	
RASGRP1	AL590867.2	PKMP1	LXK1	SNHG25	EEF1A1P34	TLNRD1	POTEE	PRDX3	TMEM255A	AC026721.1	NCF4	REXO1	SIVA1	TCEAL3	ATP5F1E	ABC89	
RPSA	AC008038.1	ALX1	BRD4	TUSC1	EEF1A1P29	MIB2	SLC35E1	AC079949.2	STK17A	AL450332.1	CUTC	TNLI1	SIP1A	FCER1G	SNX27	TFPI2	
IQCC-SCHIP1	ATP13A2	PTXK2	MGMT	BKDKT	TAF4	RPL7A	HNRNPKP2	ITGAE	AC004086.1	BAG3	RPL10	ATP5P0	CAV2	Z84468.2	DOCK8	MT-TS2	
RPS18P12	FYN	GASS5	PPDF	GSC	KRT81	EEF1A1P16	MKX3D	ANAPC4	TNFRSF21	HOXA4	DHX9P1	BICRA	EEF1A1P25	MLHP	SPATA20P1	MAOA	
PTMAP4	RPLP0P6	SLC9A7	ADAM19	SASH1	CLEC14A	CAVIN1	CX3CL1	FLRT3	TRIP4	AP001000.1	KLIF4	PTMAP9	TMEM14C	WF51	TUBBP1	TRIB1	
HOXB2	ADGRD1	RFLNB	WDR61	NKG6-1	TOR3A	SLC2A12	G1A1P1	ACTB	AK1	SNX9	ERICH2	NDFU86	PMPCB	CAPS	PAPPA2	C1QC	
APOL6	PLPFR2	MT-TL1	AC026877.1	SCAF1	TNFAIP6	TAFAS	AC014622.5	FBGR3L	MER2	TMEM131L	FCGR3A	OBSCN	PNMA2	ADAMTS9	SIPAL13	PSM6C	
MAB21L1	AC009349.2	PTPRD	CLEC11A	BCAR3	GAPDH5P6	LANCL3	MPG	MIR137HG	TCEA1	B4GLT3	EEF1A1	CA13	KT112	MEMO1	AC14831.1	AC009299.2	
FOXD1	BMP8B	TGFBI	RPL7	ATN1	MGRN1	LBH	PERR1	CH13L1	DNAJB4	SOCSF30	GMD5	AC018697.1	LARS	CA2	AC245100.3	SNHG15	
HAND2-AS1	C11orf87	GAPDH6P0	RPL39	MGAT2	ZNF668	RPL10P9	RPS8	CD274	IER5L	KNCNB1	C1QB	EGF	TOMM5	ENDOG	KNCS3	EMP1	
AKR1C1	CNTNAP3B	PRTFDC1	HIVP63	NUDT10	SLC16A2	SCN3A	HSCB	SCARF2	F1F35	ELAC1	LRRRC47	PRKCA	TPN32G1	FZD2	MEPCE	SCAF2	
AL135905.2	PRTT	AC004453.1	COL4A4	MIR9A9HG	MORN2	PPIAP22	RPL29P11	IRF2BP1	ADGR2	LKHL21	PTPN6	MORN2	CNN2	ACTBP2	S100A9	STRK34	
HAND2	SNRPE	MAGED4B	OTUD5	IL13R1	ARC	ITGA3	UBALD2	ZNF414	F8XL19	ANXA1	GPR158	TLR1	P16	AL691447.2	AP3D1	CASP4	
LDHA7	AL059714.1	PIPSK1L	RPL34	PTSM6	ACTN1	IT3GAL1	AGAP2-AS1	ZNF787	MRP11	STM16	PADI2	DNKAP1L	SEM5A	ARHGAP21	NMRAL2P		
CRLS1	HNRNCP2	RSRC1	XYLT2	RPL23A	GLCCI1	PSMG2	NACCI1	AC078817.1	MYH11	TBX4	RANP1	CHERP	E1F3E	LAMA2	OSER1-DT	MCF2L	
TIMP4	IVD	EPPIK1	RAB8A	ERF	DCDC1	HOXB8	NUDT3	CHCHD2P2	TRIA1P1	GLDN	AC113404.3	LINC01138	NLRP3	COTL1	R653	DBNDD1	
EXTL1	ABCA2	HOXA3	PCGF2	CDC5C1	SDHD	AMIGO2	MAGEL2	LOC60	PREX2	QKTRP	LRCH4	MAPK1P1L	HOXA2	ANXA2P3	PLA1A	CASP1	
AF201337.1	B3GALT2	GMP1	ANXA2P2	ADARB1	RPS29	FAM222B	LIMK1	AC130371.2	UBE2M	MBOAT2	PRELID2	ATP1A2	LV75	PLCXD1	C8orf76	OLFM1	
SMURF2P1	PIM3	PIGF	TOR4A	RAVER1	CAP1P2	ECHDC1	CARHSP1	UBTD1	LINC00595	SABP3	SPRYD7	RPL13AP5	MAP3K10	C8orf33	PCDD4	ATF5	

MGUS vs MM Overlap

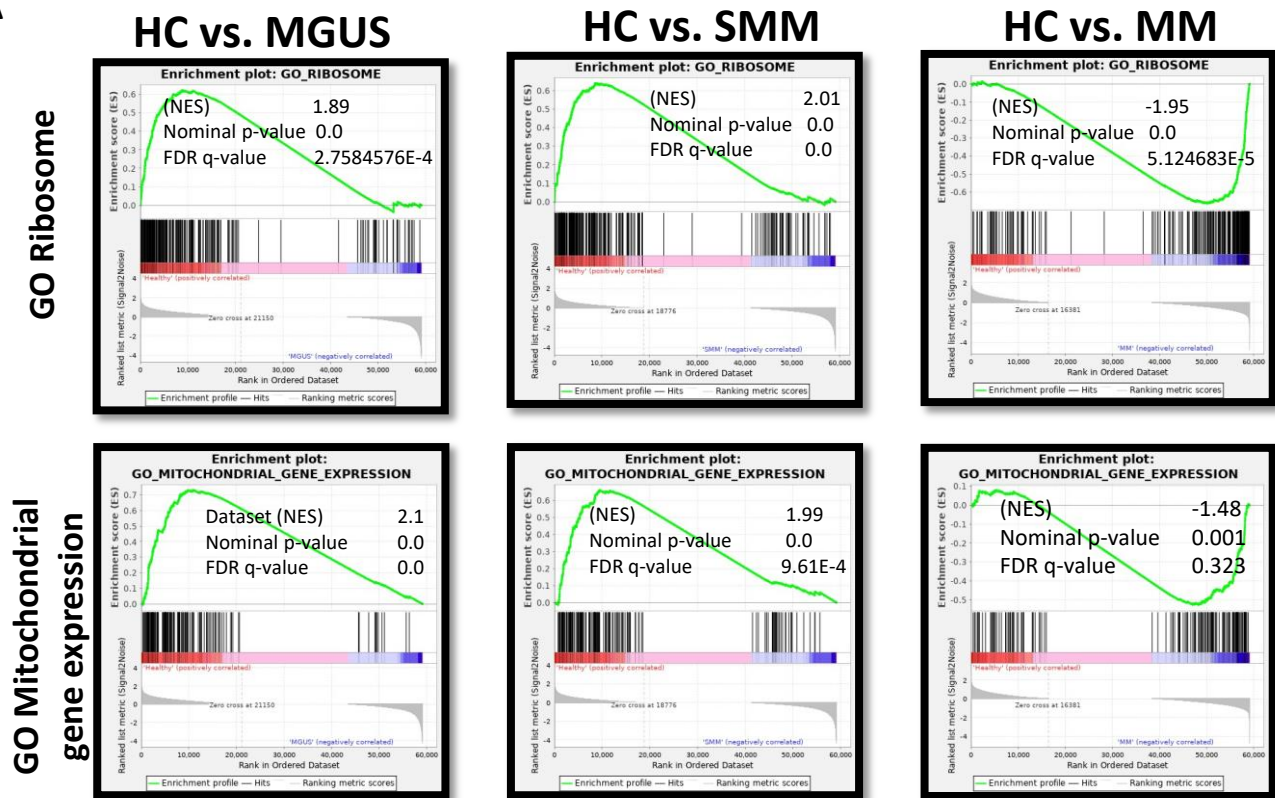
HOXB7	AC093849.2	COL4A4	ARC	MMP20X5	RFX5	METTL26	C1TNB81	LINC02217	ADAMT59	FER1L4	AC116533.1
HOXB4	BMP8B	RPL34	DCDC1	CSF1R	TMEM100	KNCN81	OTOF	SLC22A17	LAL3B1	PAPPA2	CASP1
SHOX2	C11orf87	KYNU	RPS29	ME3D3	AC004201.4	CEP152	NDUF81	TNXCDD1	CA2	AC24500.3	AL69420.1
HOXB21L2	CNTNAP3B	PCGF2	GTM46B	CXCR4	STMY2	SLC4A2	ELL	LAMTOR4	LHFPL6	FAM241B	ARHGAP4
MT-TY	PR67	SOC52	HSD17	GFYF98	ISM1	OPN5	IRW6	OSGEP	KCNK3	5GDP5P	SCGB3A2
ZNF703	IVD	PCAT6	INDUP411	RPS8	OHFLM2A	GLDN	LYPD6	SIPA1	FILP1L	BLOC155	SHROOM2
NFRF1	B3GALT2	PSMA1	ENTPD8	HSC6B	ARHGDA1	MGARP	PARP14	SLC2A12	CERN1	VSTM2L	CLCA2
TFAP2A	RPSO3	ANOS	AQP1	INSC	FZD8	IL7B	NRN1	WRDS3	PGK1	LRP10	D3CHAV1L1
HOXB3	PIM3	SOC52-AS1	UBALD2	MWOP	NDL2	MFS014A	PANMA2	NOTCH1	P2RY6	OZFMI1	
SLC24A3	TBX15	ENPP2	AL122020.1	CDC42EP5	AC093890.1	UNG	PXDC1	ZFPA2	AL691447.2	ARHGAP27	POLR2J3
TMSB4XP4	DCLK2	MAZ	ANKRD1	MAGEL2	LINC00654	ABCD1	D0X6G	LARS	FBLM1	STBD1	MT-TC
IGFBP11	SALL1	RPS12	RPL5P4	UKM1	RPS21	RPS18	TPSAN15	PIIRA	LAMA2	ARHGAP21	CDC7C
COL5A1	LINC09000	STK23A	SH3BP1	CAHSP1	CHMP1B3P	TB18	CXCL16	P16	TRND	MIR210	DTX3L
RASGEF1	NACA	STRAG	PRAG1	NUDT11	ABCA13	ADAMT55	BST1	ADY10P1	AF3	PCOD4	TMEM148
AC02034.1	HOXB5	TLES	TRIM67	GYPE	TMEM255A	AC025164.1	CIQTNF1	NLRP3	TNXCDS	PTMS	SAT2
HOXB2	CACNA2D3	SELENOP	MOK	HOXA-52	STK17A	STYK1	KCN41	HOXA2	MARX3C	ZNF518B	PCDH18
APOL6	ALX1	NTRK2	HSP61	SGCA	AC004086.1	TRABD	ZNF170	L7Y5	SPL2ZA	WWC1	NTF3
MAB21L1	PTXZ	ASP	CXO6A1	NEM6	FAM87A	P2RX5	SLC12A8	DTX4	USF2	CEBPA	H5G5T1
HAND2-AS1	RFLNB	MIPEP	PTPRE	RPS15A	TCEA1	CDKN2A	ATP5P0	RNASE2	TSC22D4	LTCA5	CHCHD1
HAND2	MT-TL1	RPL3P4	TNXB	ZNF579	PADI1	LYN	CA13	CANX	CTBP1	HDAC10	KRT17
TLR5	PTPRD	SNHG25	RAB11B	BAIAP211	RLTB	TPSAN13	AC018697.1	ALKRH2	TRMT61B	SF3A1	
CADM1	TGFBI	CPE	MIB2	HOMAS	MHL1	SHSAL1	SLC25A1	POLD4	EMK2	TTC12A	
TIMP4	PDE3A	SASH1	RPL7A	RPL31	PREX2	MK2	TRIR	PCDH6B	NKX2	F10	
EXTL1	PRFDC1	NKG6-1	SLC2A12	XPMPPE2	RPS13	TMEM258	DCLK1	APH1B	FOXF2	RPS19	
AF201337.1	AC004453.1	NUDT10	LBH	RPS7	PSAT1	LINC01629	CHERP	ZNF408	POU2F1	SLC40A1	
HOXB6	RSRC1	IL18R1	SCN3A	HIP1R	CLIC3	TMEM204	RASGEF3	PAC2	GATA6-AS1	PLA2G2A	
MOCOS	HOXA3	RPL23A	PSMG2	DCH51	EMT14	ATP1A2	P1GB051	FCGR2B	F3		
TNFRSF19	RASSF7	ADARB1	HOXB8	PCSK1N	ERAP1	TSP1	AP006965.2	PTGER1	SHISA4	AC011352.3	
SMOC2	GMP1	RAVER1	SEMA3D	RPL14P1	MARK4	PCDH9	CFR6	D3EAP	CD320		
FOX2P	PIGF	HTRA3	FAS1	PLAG2A	TPSAN11	AMZ1	PAPPA	DX3	AP2A1	COMM4D	
SOX11	ELN	MPPED2	TMEM158	FLRT3	HEY2	AP006995.1	AC004156.1	SLC20A2	SMDT1	NRL3	
ALDH1B1	ALDH3A2	OSR2	NRP2	ACE2	BGN	KLF4	TM2	TK2	C9orf46	EGF7	
SCARAS	NRXN3	CDKN2B	TFE8	ACTB	CRIM1	AL519345.1	FAM160A1	STR3A1	TMEM184B	ZNF771	
STEAP4	MHYH13	FOXCUT	C4orf48	P2RX1	ECM2	HSPB1	ZNF664	TUB	PIK3R1	SLC22D1-AS1	
MTCO2P12	ZMYND15	PCED1B	ASPA	MZT2A	GBG1	AC004601.1	S5BP3	MCLP2	WNT5B	TFPI2	
RPLP4	PARP9	NR2F1-AS1	BONF	MIR137HG	CLN4	PTPN6	NDUF9A	F1L1	S5182	MT-TS2	
IL13RA2	KHLH13	ZNF85D	SMO2	CH13L1	AC026271.1	GRP158	LINC01684	SIN3A	ETV6	MAOA	
PAX9	LYPD1	PROS1	CYP19A1	IRF2BP1	AL450332.1	PADI2	PITPN1	RNYS4	SMARCA5-AS1	TR181	
PRR12	FBN2	LMO3	ANKRD37	ZNF414	AC012462.1	C1orf162	COR3A1	WDR21	TPG12	SBD1	
BRP	MGMT	DNMT1	EN1	ZNF787	HOXA4	AC113043.3	PDE1A1	TMUB1	ZNF321	CB2	
HR43	PROPF	JTB	RFLNA	LINC01298	SOX6	CHEK2	TCEAL3	ATP5F1E	ENP1		
FYN	CLEC11A	KRT81	ARHGDB1	AC130712	NOVA1	HDX181	NDNF	Z84682.2	CAP1	SPRY3	
TMTC1	SLC9A9	CLEC14A	ADAMT56	UBALD2	SNX9	PTGER4	MARVELD2	SENR	BCL9L	LINC020	
ADGRD1	CD47	TNFAIP6	EPGN	PGDFG	FN3K	CLIP3	CLDN14	GBP1P1	SPATA20P1	MCF2L	

SMM vs MM Overlap

HOXB7	KCNK5	WNT5B	HCLL1	LINC01629	UCHL3	NTRK	RPL5P4	CCD4B	RAB32	DGAP1	PRDM16-DT	MROH1
RAP2B	ENC1	PTD3	RGS16	ITGA9	NKXAP5-AS2	MAP3K	BAIAP2	TNFRSF2				

Suppl. Figure 3

A



B

