

Supplemental Table 1. GSEA analysis of MEN1703-treated DLBCL cells

	MSigDB C2 symbols (curated) gene sets	SIZE	ES	NES	NOM p-val	FDR q-val	FWER p-val	Core enrichment genes
	Top 20 Gene Sets downregulated by MEN1703							
1	REACTOME APC CDC20 MEDIATED DEGRADATION OF CYCLIN B	18	0.74	2.23	0.000	0.065	0.020	CDC20,CDK1,CCNB1,ANAPC7,ANAPC15,UBE2C
2	YU MYC TARGETS UP	33	0.75	2.08	0.004	0.155	0.075	PLK1,KIF20A,MKI67,CDK1,HMGB2,CCNB1,CCNB2,BUB1,KPNA2,CKS1B,ASPM,CDKN3,UBE2S,AURKA,UCHL5,HMGN2
3	LY AGING OLD D N	45	0.63	1.98	0.016	0.262	0.126	CDC20,CCNA2,HMGB2,KIF14,CCNB1,CCNF,CKS1B,UBE2C,KIF23,KIF11,H2AZ1,KIF2C,HMGN2,PSM C6,PKMYT1,CDC25B,PSMC2
4	REACTOME APC CDC20 MEDIATED DEGRADATION OF NEK2A	18	0.59	1.98	0.023	0.197	0.126	CDC20,ANAPC7,ANAPC15,UBE2C,MAD2L1,ANAPC1,ANAPC5
5	RHODES UNDIFFERENTIATED CANCER	60	0.55	1.97	0.008	0.166	0.130	CENPA, CDC20, CCNA2, CDK1, HMGB2, KIF14, CCNB1, KPNA2, CKS1B, CDKN3, UBE2S, UBE2C, KIF23, RAD21, H2AZ1, NCAPD2, KIF2C, GPM2, TOP2A, IFI30, FOXM1, TRIP13, CEBPG, MAD2L1
6	SCHLOSSER MYC AND SERUM RESPONSE SYNERGY	28	0.60	1.96	0.004	0.157	0.136	DDX28, PYCR1, SNRPA, CCDC85B, FARSA, MRPL12, CXorf40A, KHSRP, EIF4A1, COG2, LARP1, ZNF22, SRM, RNF126
7	FISCHER G2 M CELL CYCLE	143	0.62	1.96	0.014	0.136	0.136	PLK1,KIF20A,ESPL1,PSRC1,PIF1,LDLR,CENPA,HMMR,AURKB,CDC20,MKI67,TTK,CCNA2,CDK1,KN STRN,CKAP2L,CENPE,TROAP,JADE2,HMGB2,PPP1R10,KIFC1,KIF14,CDCA3,CCNB1,CCNF,CCNB2, BUB1,KPNA2,TPX2,CKS1B,ASPM,SERTAD3,ARHGAP19,NUP50,CDCA8,TACC3,UBE2S,AURKA,UBE 2C,DKN1B,KIF23,E2F5,RAD21,SGO1,KIF11,SAPCD2,PLK4,KIF2C,CDC25C,HJURP,FAM83D,LBR, KPNA1,DCXR ,MMPHOSPH9,KIF5B,METTL4,MAT2A,PRC1,KIF22,AMD1,CDC25B,NUSAP1,ND1,TRIP13,MCM7,MAD2L1,NDUFA7,TME BIRC3,TMPO,RDH11,CEP55,TF2,PNRC2,CDKN2D,FOXM1
8	HORIUCHI WTAP TARGETS DN	209	0.53	1.95	0.008	0.131	0.141	PLK1,KIF20A,CENPN,ESPL1,PSRC1,SPC24,PECAM1,CENPA,HMMR,AURKB,CDC20,MKI67,TTK,CCN A2,CDK1,CKAP2L,SPC25,TROAP,CD44,PBRM1,HMGB2,UQC2,KIF14,CDCA3,CCNB1,CCNF,CCNB2, CCNB2,BUB1,CENPM,PRR11,TPX2,CKS1B,ASPM,HNRNP3A,CDKN3,CDCA8,UBE2S,AURKA,MPRI P,UBE2C,KIF23,ASF1A,KIF4A,KIF11,NCAPD2,KIF2C,GLS,NUCKS1,HJURP,FAM83D,LBR, KPNA1,DCXR ,LMNB1,NCAPG,PRC1,KIF22,SLC25A5,IMPDH2,CDC25B,BNIP2,MEN1,NUSAP1,VRK1,HMGA1,TPP1 ,ARL6IP6,TP2A,TMPO,CEP55,DDX11,LMNB2,PNRC2,FOXM1,TRIP13,MCM7,MAD2L1,NDUFA7,TME M64,ODC1,PBK,UBXN2A,TOR3A,C1QBP,HACL1,ACAT2,CDC42
9	MORI LARGE PRE BII LYMPHOCYTE UP	71	0.64	1.95	0.014	0.117	0.141	CENPA,CDC20,MKI67,TTK,CCNA2,CDK1,CENPE,STMN1,CDCA3,CCNB1,RRM2,CCNB2,TUBB4B,SM C4,KPNA2,CKS1B,CDKN3,UBE2S,AURKA,KIF23,RAD21,H2AZ1,IDE,NUCKS1,HJURP,HMGN2,LGALS 1,SLC29A1,LMNB1,PRC1,KIF22,RANGAP1,HMGA1,TP2A,TMPO
10	WHITFIELD CELL CYCLE LITERATURE	38	0.69	1.94	0.000	0.110	0.144	PLK1,KIF20A,CENPA,CDC20,CCNA2,CDK1,CCNB1,CCNF,RRM2,CCNB2,BUB1,CDKN3,AURKA,E2F5, CDC25C
11	REACTOME APC MEDIATED DEGRADATION OF CELL CYCLE PROTEINS	69	0.49	1.93	0.016	0.111	0.149	PLK1,AURKB,CDC20,CCNA2,CDK1,CCNB1,ANAPC7,PSMD8,ANAPC15,AURKA,UBE2C,PSMD4,PSM C3,PSMC6,PSMC2,PSMD3,PSMD7,PSME3,MAD2L1,PSMB4,PSMC4,PSMB10,PSMB6,PSMA4,ANAPC 1,ANAPC5
12	HU GENOTOXIC DAMAGE 4HR	23	0.65	1.93	0.000	0.102	0.149	CDC20, BUB1, KPNA2, AURKA,CDC25C,SYNCRIP,TRAFD1,PRC1,KIF22
13	TANG SENESCENCE TP53 TARGETS DN	40	0.72	1.92	0.006	0.098	0.152	KIF20A,CENPA,AURKB,CDC20,TTK,CCNA2,CDK1,CENPE,CCNB2,BUB1,SMC4,TPX2,UBE2C,KIF23,K IF4A,KIF11,PLK4,LMNB1,TCF4,PRC1,NUSAP1,TP2A,KIF20B
14	WONG EMBRYONIC STEM CELL CORE	275	0.41	1.92	0.025	0.094	0.155	PLK1,KIF20A,HNRNP1A,LBHD1,AURKB,CDC20,TTK,CCNA2,CDK1,DHX9,G3BP1,HMGB2,DARS2,MR PS28,CDC43,SNRPA,CCNF,RRM2,CCNB2,BUB1,MRT04,WDR77,SMC4,KPNA2,CKS1B,CDKN3,FAR SA,CDC48,AURKA,TP53,KIF23,TRIP6,KIF4A,KIF11,PLK4,NCAPD2,PPP3,MRPL12,RFC3,GENM2,PR I M1,TIMM44,LMNB1,RUVBL2,KIF22,SLC25A5,IARS1,EIF4A1,PA2G3,NUSAP1,PPP40,SEPHS2,RCC1, VRK1,BANF1,ADSL,TGIF2,TP2A,SLC2A1,GNL3,ABCY2,PSME3,EIF6,PRMT1,HNRNP1,STIP1,TRIP1 3,MCM7,MID1IP1,MAD2L1,NDUFB8,ZNF22,UBE2G1,NTHL1,SS18,NDUFA9,UBE2V2,CSE1L,PUS1,BA X,DLGAP5,GARS1,MRPS2,RUVBL1,CCNC,YY1,BRIX1,MTHFD2,HSPA14,HNRNPAB,PSMB6,ND80,E IF3K,GMNN,CHEK2,PDCC2,LSM4
15	REACTOME MITOTIC METAPHASE AND ANAPHASE	175	0.46	1.92	0.039	0.089	0.161	PLK1,CENPN,ESPL1,SPC24,PMF1,CENPA,AURKB,CDC20,CDK1,SPC25,CENPE,CHMP6,CCNB1,CC NB2,SPDL1,NUP188,BUB1,CENPM,TUBB4B,ANAPC7,PSMD8,ANAPC15,CDC48,UBE2C,RAD21,SGO 1,SKA2,KIF2C,PPP2R1B,PSMD4,LBR,KNB1,PSMC7,LMNB1,PSMC6,PSMC2,RANGAP1,RCC1,VRK1, PSMD3,ZWINT,PSMD7,BANF1,ND1,TPMO,PSME3,SKA1,SEH1L,MAD2L1,PPP2CB,UBE2I,PPP2R2A ,NUP93,PSMB4,RAN,PPP2R5C,KNTC1,NUP43,DYNLL1,PSMC4,ANKLE2,PSMB10,PPP2CA,PSMB6N DC80,TUBA1C,PSMA4
16	LI WILMS TUMOR VS FETAL KIDNEY 1 DN	123	0.54	1.91	0.002	0.089	0.163	ESPL1,UCK2,AURKB,CDC20,MKI67,TTK,CDK1,STMN1,XPOT,YARS1,KIFC1,KIF14,CCNB2,NUP188,M ARS1,SMC4,KPNA2,TPX2,CKS1B,CDKN3,NOLC1,AURKA,KIF23,KIF11,H2AZ1,DKC1,PLK4,KIF2C,CD C25C,PRIM1,MPHOSPH9,LMNB1,ASNS,IARS1,ADD2,TP2A,SCRN1,TRIP13,MAD2L1,SS18,GTFC32, PPP2R2A,SHMT2,FADS1,TP53BP2,SRPK1,YWHAZ,DLGAP5,GARS1,TARBP2,PFKP,ANKLE2,MTHFD 2
17	WHITFIELD CELL CYCLE G2 M	110	0.58	1.91	0.000	0.084	0.163	PLK1,CENPA,HMMR,CDC20,MKI67,TTK,CCNA2,KNSTRN,CENPE,JADE2,PPP1R10,KIF14,CDC43,CC NB1,CCNB2,SPDL1,BUB1,PRR11,TUBB4B,TPX2,CKS1B,ARHGAP19,AURKA,E2F5,RRP1,SAPCD2,KI F2C,SPTBN1,ASXL1,LBR,GPM2,KIF5B,NCOA5,GRK6,CDC25B,NUSAP1,RANGAP1,TMEM138,GSE1 ,KIF20B,QRICH1,CEP55,HCFC1,HSPA8,SOGA1,MDC1,CDKN2D,USP16,FOXM1,TRIP13,PBK,RE, S S18
18	GARGALOVIC RESPONSE TO OXIDIZED PHOSPHOLIPIDS TURKUISE DN	43	0.62	1.91	0.004	0.083	0.163	PLK1,ESPL1,XAF1,SPC24,CDC20,MKI67,DDX28,CCNA2,KIFC1,CCNF,POLR3B,PIK3CG,TACC3,AUR KA,F8A1,PAGR1,RRS1
19	SCIAN CELL CYCLE TARGETS OF TP53 AND TP73 DN	20	0.77	1.90	0.008	0.080	0.163	CDC20,CCNA2,CCNB1,CCNF,TPX2,CDKN3,AURKA,UBE2C,KIF23,CDC25C,MAPRE2,KIF22,CDC25B
20	CHAUHAN RESPONSE TO METHOX YESTRADIOL UP	35	0.61	1.90	0.014	0.077	0.165	RBM3,YARS1,CCNB1,CIRBP,UBE2S,PMM2,CKB,ATF4,HMGN2,TIMM44,ASNS,SRSF2,HSPA8,AHSA1 ,CARS1,AARS1,SRM,GARS1,UBE2G2,UBE2M,HDFG,MYC,DNAJA1,PTTG1
	MSigDB Hallmark gene sets							
	Top 20 Gene Sets downregulated by MEN1703	SIZE	ES	NES	NOM p-val	FDR q-val	FWER p-val	Core enrichment genes

1	HALLMARK_MYC_TARGETS_V1	187	0.40	1.99	0.030	0.035	0.019	HNRNPA1, CDC20, CCNA2, G3BP1, XPOT, HNRNPC, HNRNPD, SNRPA, KPNA2, PSMD8, HNRNPA3, NOLC1, RRP9, H2AZ1, SYNCRIP, KPNB1, COPS5, RUVBL2, SF3B3, PSMC6, IMPDH2, IARS1, EIF4A1, PA2G4, SRSF2, PSMD3, PSMD7, EIF4G2, NOP56, GNL3, KARS1, CAD, MCM7, MRPL23, AIMP2, MAD2L1, ODC1, SERBP1, DDX21, C1QBP, MRPL9, HSP90AB1, SRSF1, RAN, SRM, CNBP, TRA2B, SRPK1, PSMC4, RANBP1, CDC45, PSM4, ABC1, XRCC6, SRSF7, SMARCC1, NOP16, GOT2, CANX, HDGF, MYC, EIF4H, LDHA, SRSF3, HSPD1, PSMB2, CYC1, TRIM28, MRPS18B, CDK4, EIF3J, DDX18, U2AF1, HSP61, STAR7, EEF1B2, CCT3, TYMS, PCNA, PSMB3, RSL1D1, ILF2, MCM5
2	HALLMARK_G2M_CHECKPOINT	147	0.59	1.91	0.014	0.021	0.020	PLK1, ESPL1, ATF5, UCK2, CENPA, HMMR, MARCKS, AURKB, CDC20, MKI67, TTK, POLA2, CCNA2, CDK1, CTCF, ILF3, G3BP1, CENPE, STMN1, TROAP, HNRNPD, CCNF, CCNB2, BUB1, SMC4, KPNA2, TPX2, CKS1B, NUP50, CDKN3, NOLC1, TACC3, UBE2S, AURKA, UBE2C, CDKN1B, KIF23, KIF4A, RAD21, KIF11, H2AZ1, DKK1, PLK4, KIF2C, SYNCRIP, LBR, HMGN2, KIF5B, KPNB1, LMNB1, PRC1, KIF22, AMD1, CDC25B, NUSAP1, SRSF2, HMGA1, TOP2A, KIF20B, TMPO, HSPA8, SLC7A1, MAD2L1, EWSR1, SLC38A1, ODC1, DDX39A, PBK
3	HALLMARK_E2F_TARGETS	166	0.54	1.89	0.004	0.014	0.020	PLK1, ESPL1, SPC24, HMMR, AURKB, CDC20, MKI67, POLA2, CDK1, CTCF, SPC25, CNOT9, ILF3, CENPE, STMN1, HMGB2, HNRNPD, CDCA3, RRM2, CCNB2, CENPM, SMC4, KPNA2, CKS1B, CDKN3, MXD3, CDCA8, NOLC1, TACC3, UBE2S, AURKA, TP53, CDKN1B, LYAR, ASF1A, KIF4A, RAD21, H2AZ1, PLK4, NCAPD2, KIF2C, SYNCRIP, RFC3, ATAD2, LBR, LMNB1, KIF21, KIF22, EXOSC8, CDC25B, PA2G4, SRSF2, HMGA1, TOP2A, NOP56, TMPO, DONSON, NBN, DCK, TRIP13, MCM7, TBRG4, MAD2L1, DDX39A
4	HALLMARK_MITOTIC_SPINDLE	110	0.43	1.55	0.012	0.066	0.123	PLK1, ESPL1, PIF1, MARCKS, TTK, CDK1, CENPE, ARHGDI2, CCNB2, BUB1, SMC4, BCL2L1, TPX2, AURKA, KIF23, KIF4A, CSNK1D, KIF11, KIF2C, SPTBN1, KIF5B, CNTRL, LMNB1, RHOF, SUN2, PRC1, KIF22, NUSAP1, ACTN4, ARHGEF2, TOP2A, KIF20B, TBCD
5	HALLMARK_MTOR_C1_SIGNALING	156	0.35	1.40	0.035	0.166	0.367	PLK1, LDLR, NFKB1B, HK2, ATP5MC1, SLA, CCNF, RRM2, HMBS, BUB1, PSAT1, CORO1A, SLC37A4, AURKA, CALR, RRP9, UCHL5, NIBAN1, GBE1, HMGC1, EBP, HSP90B1, UBE2D3, ASNS, COPS5, TRIB3, PSMC6, PSMC2, SLC1A5, SLC2A1, RDH11, PSME3, NFYC, INSIG1, JFI30, STIP1, GSK3B, GMP5, HSPA5, DDX39A, ARPC5L, FKBP2, SHMT2, FADS1, GLRX, ACTR2, PSMC4, MTHFD2, PSM4A, DHFR, ATP2A2, BTG2, CANX, PP1R15A, LDHA, HSPD1, SERP1, PGM1, BCAT1, DHCR24, DHCR7, SC5D, EEF1E1, ACLY
6	HALLMARK_UNFOLDED_PROTEIN_RESPONSE	95	0.44	1.38	0.050	0.163	0.424	CEBPB, XPOT, NFYA, PSAT1, CKS1B, HYOU1, CNOT2, NOLC1, JFIT1, CALR, RRP9, DKC1, ATF4, HERPUD1, KIF5B, KHHRP, EXOSC5, HSP90B1, ASNS, EIF4A2, SPCS3, EIF4G1, IARS1, EIF4A1, BANF1, NOP56, EXOSC4, ERN1, SRPRA, CEBPG, ALDH18A1, HSPA5, NOP14, DNAJ3, PDIA5, PREB, SHC1, YWHAZ, PDIA6, MTHFD2, IMP3A
7	HALLMARK_MYC_TARGETS_V2	54	0.58	1.35	0.141	0.187	0.517	PLK1, HK2, SLC29A2, PPAN, RRP12, MRTO4, FARSA, NOLC1, WDR43, PPRC1, RRP9, PLK4, GRWD1, EXOSC5, NOC4L, IMP4, RCL1, WDR74, PA2G4, NDUFAF4, NOP56, GNL3, IPO4, SLC19A1, DUSP2, AIMP2, TBRG4
8	HALLMARK_SPERMATOGENESIS	34	0.34	1.31	0.096	0.261	0.698	TTK, CDK1, CCNB2, BUB1, CDKN3, AURKA, KIF2C, IDE
9	HALLMARK_PI3K_AKT_MTOR_SIGNALING	63	0.36	1.28	0.083	0.296	0.773	NFKB1B, CDK1, MAPK9, SLA, ARHGDI2, ECSIT, CDKN1B, CALR, PPP2R1B, HSP90B1, UBE2D3, TRIB3, SLC2A1, GSK3B, ITPR2, MAPKAP1, PTEN, RPS6KA1, ACTR2, ARF1, GRB2
10	HALLMARK_GLYCOLYSIS	92	0.32	1.26	0.031	0.333	0.831	KIF20A, CLN6, CENPA, HMMR, CDK1, HK2, STMN1, CD44, SLC16A3, SLC37A4, AURKA, B4GALT7, PMM2, B3GALT6, FKBP4, ISG20, B4GALT4, COG2, PKM, HSPA5, BPNT1, PPP2CB, DLD, MED24, PGLS, GLRX, ARPP19, PSMC4, PFKF
11	HALLMARK_ALLOGRAFT_REJECTION	94	0.38	1.12	0.321	0.706	0.983	CCL4, CD40, IRF7, FGR, LY86, FCGR2B, HLA-E, CD79A, HLA-DOB, GZMB, TAPBP, NCF4, SIT1, CD86, MAP4K1, HLA-DQA1, CD74, IL2RB, SOCS1, IKKBK, HLA-DMA, EIF4G3, IFNAR2, AARS1, SPI1, DARS1, BCL3, STAT1, IL4R
12	HALLMARK_INTERFERON_GAMMA_RESPONSE	121	0.51	1.02	0.525	1.000	0.990	SAMD9L, HLA-B, XAF1, CD40, GPR18, IRF7, ZBP1, OASL, IFI35, CD38, CASP1, JFIT3, HERC6, DD60, EPST11, TAPBP, VAMP8, CD86, JFIT1, SOD2, LAP3, TNFAIP3, IFI44L, HLA-DQA1, CD74, PEL1, BST2, PIM1, ISG20, TRAFD1, OAS2, IL2RB, SOCS1, DHX58, HLA-DMA, IFI30, PLSCR1, IFNAR2, IFI44, PTPN1, STAT3, NUP93, IL10RA, PTPN2, TDRD7, HLA-DRB1, STAT1, IL4R, NFKB1A, PFKF, TRIM26, MTHFD2, PSMB10, TRIM25, ADAR, CASP7, MVP
13	HALLMARK_COAGULATION	23	0.37	1.00	0.528	1.000	0.997	PECAM1, PLEK, TMRSS6, USP11
14	HALLMARK_COMPLEMENT	71	0.34	0.89	0.688	1.000	1.000	IRF7, CEBPB, PLEK, CASP1, TMRSS6, MSRB1, GZMB, PIK3CG, LAP3, TNFAIP3, CA2, PIM1, PRKCD, GNGT2, USP16, PLSCR1, HSPA5, SRC, PPP2CB
15	HALLMARK_CHOLESTEROL_HOMEOSTASIS	40	0.36	0.88	0.595	1.000	1.000	ATF5, LDLR, LSS, PCYT2, NIBAN1, FBXO6, HMGC1, EBP, TRIB3, ACSS2, PLSCR1, ACAT2, FASN, ACTG1, PMVK, MVD, DFDT1
16	HALLMARK_INTERFERON_ALPHA_RESPONSE	70	0.51	0.87	0.668	1.000	1.000	SAMD9L, IRF7, OASL, IFI35, CASP1, JFIT3, TRIM5, HERC6, DD60, EPST11, LAP3, IFI44L, HLA-C, CD74, BST2, ISG20, TRAFD1, OAS1, DHX58, NCOA7, IFI30, PLSCR1, IFI44, SAMD9, TDRD7, IL4R, TRIM26, MOV10, PARP9, TRIM25, ADAR
17	HALLMARK_ANDROGEN_RESPONSE	53	0.22	0.81	0.957	1.000	1.000	CENPN, GPD1L, RRP12, ZMIZ1, PIAS1, HMGC1, SPCS3, PA2G4, INSIG1, CAMKK2, UBE2I, FADS1, FKBP5, CDK6, XRCC6, NGLY1
18	HALLMARK_UV_RESPONSE_DN	43	0.24	0.76	0.914	1.000	1.000	LDLR, CDKN1B, ID1, ZMIZ1, PMP22, PEX14, DMAC2L, INSIG1, SLC7A1, PIAS3, SPOB, PTEN
19	HALLMARK_INFLAMMATORY_RESPONSE	59	0.30	0.72	0.925	1.000	1.000	LDLR, CD40, IRF7, TAPBP, PTAFR, RNF144B, BST2, IL2RB, LTA, CD82, HBEGF, SLC7A1, CD70, TNFRSF1B, IL10RA, IL4R, NFKB1A, TNFSF9, ATP2A2, BTG2, MYC
20	HALLMARK_KRAS_SIGNALING_UP	54	0.24	0.71	0.975	1.000	1.000	LAT2, PECAM1, CD37, AMMECR1, MAP4K1, TNFAIP3, CA2, SPP1, BIRC3, HBEGF