

Transcriptomic Analysis of CRISPR/Cas9-Mediated PARP1-Knockout Cells under the Influence of Topotecan and TDP1 Inhibitor

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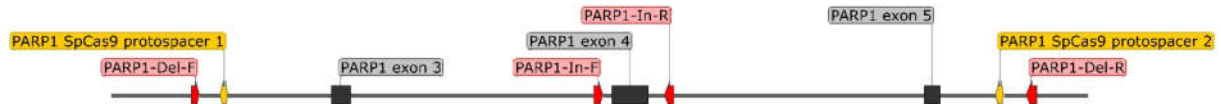
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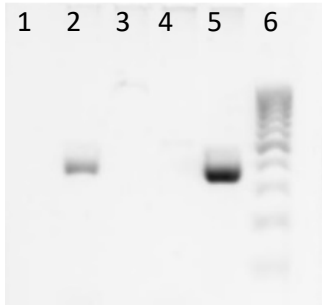
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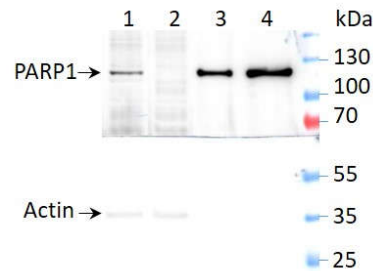
A



B



C



D

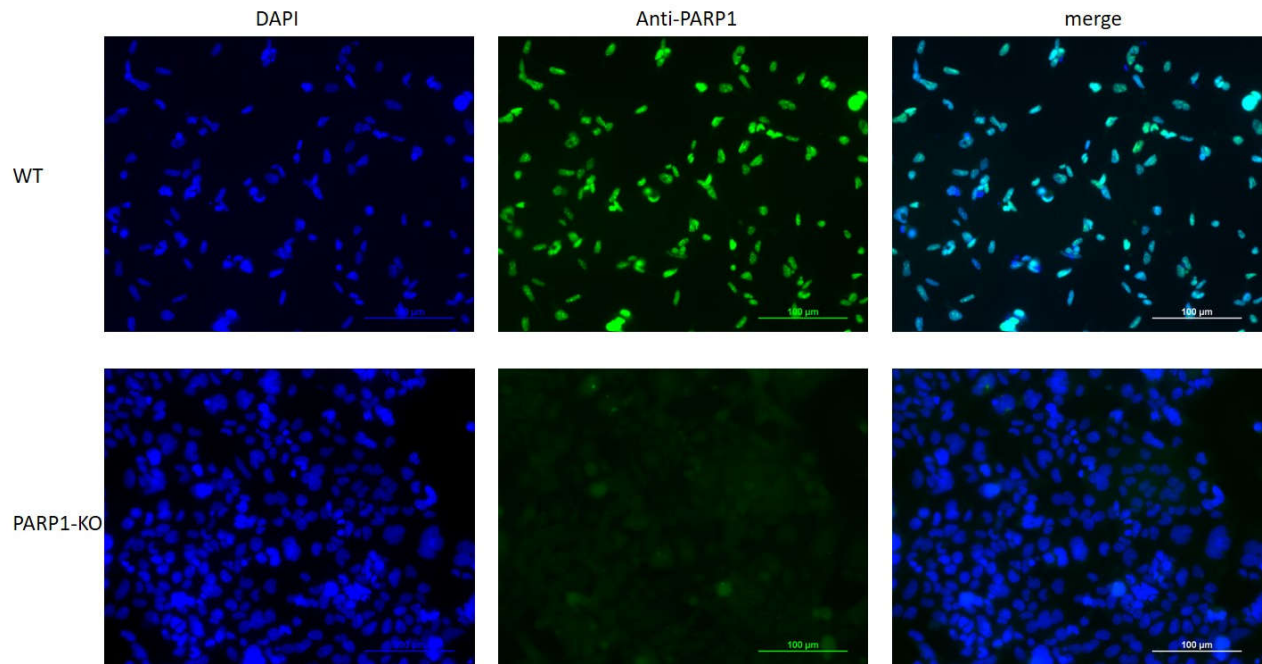


Figure S1. Scheme of deletion in *PARP1* gene (A). PCR analysis of CRISPR/Cas9-induced deletion (B): lanes: 1) H₂O; 2) PCR analysis of clone 1A3 genomic DNA with primers for detecting a deletion (PARP-Del-F and PARP-Del-R) in the *PARP1* protein gene; 3) PCR analysis of clone 1A3 genomic DNA with primers for the detection of wild-type alleles (PARP-In-F and PARP-In-R); 4) PCR analysis of intact genomic DNA of HEK293A cells with deletion detection primers (PARP-Del-F and PARP-Del-R); 5) PCR analysis of intact genomic DNA of HEK293A cells with primers for the detection of wild-type alleles (PARP-In-F and PARP-In-R) 6) DNA ladder Step100 (Biolabmix, Novosibirsk, Russia). Western-blot analysis (C): whole cell extracts were separated by Laemmli electrophoresis in 10% SDS-PAAG and were transferred on nitrocellulose membrane using semi-dry Western Blotting technique, and were probed with mouse antibody to PARP1 (Anti-Human PARP 556494, BD Biosciences) or rabbit antibody to β -actin (Abcam8226-100). Lanes: 1) HEK293A WT cells; 2) HEK293A clone 1A3; 3) purified PARP1 (20 ng); 4) purified PARP1 (50 ng); protein ladder (Thermo Fisher Scientific). Immunofluorescence analysis (D): WT and clone 1A3 cells were fixed in 4% formaldehyde and stained with DAPI or incubated with primary anti-PARP1 antibodies. Preparations were analyzed on the Nikon Ti fluorescence microscope using NIS Elements software.

Table S1. PARP1 knockout effect on gene expression. Gene set enrichment analysis results: pathways significantly associated with differentially expressed genes.

Pathway	<i>p</i> -Value	<i>p</i> -adj	NES	Number	Genes
Parkinson's disease	5.2e-16	1.6e-13	- 2.579	109	GNAI2, UCHL1, NDUFA4, SNCA, PARK7, NDUFV1, VDAC3, NDUFA8, NDUFC1, PRKACB, PINK1, UBB, COX8A, SDHD, UQCR10, NDUF56, UBE2L3, SDHA, UBE2L6, NDUF58, NDUF55, COX6C, NDUFB4, UBA1, SLC25A4, COX7A2L, COX5B, NDUFA3, NDUF53, COX7A2, COX5A, UQCRB, UQCR11, NDUFB2, UQCRQ, UQCRC1, NDUFA2, NDUFB8, NDUFA12, CASP3, VDAC2, NDUFA6, COX7B, NDUFA9, NDUF2C, COX4I1, NDUFV3, NDUFAB1, HTRA2, UBE2G2, PPIF, NDUFB10, COX6A1, PRKACA, NDUFA1, NDUFB1, SLC25A6, NDUFB3, COX6B1, NDUFB5, NDUFB6, NDUF54
Alzheimer's disease	2.8e-14	4.3e-12	- 2.413	144	BACE1, CAPN1, CDK5, PSEN2, PPP3CB, NDUFA4, RTN3, SNCA, PLCB3, CALM2, NDUFV1, CAPN2, APBB1, NDUFA8, NDUFC1, FADD, COX8A, SDHD, UQCR10, NDUF56, TNFRSF1A, SDHA, BAD, NDUF58, NDUF55, COX6C, HSD17B10, NDUFB4, COX7A2L, COX5B, NDUFA3, NDUF53, COX7A2, CALM3, FAS, COX5A, UQCRB, IDE, PPP3CA, UQCR11, NDUFB2, APH1A, UQCRQ, UQCRC1, NDUFA2, ATP2A3, NDUFB8, NDUFA12, CASP3, NDUFA6, COX7B, NDUFA9, NDUF2C, COX4I1, NDUFV3, NDUFAB1, NDUFB10, COX6A1, NDUFA1, NDUFB1, BID, NDUFB3, COX6B1, NDUFB5, CASP8, NDUFB6, NDUF54, CACNA1F, MAPK3
Oxidative phosphorylation	5.6e-14	5.9e-12	- 2.552	98	ATP6V0E2, PPA2, NDUFA4, TCIRG1, NDUFV1, COX15, NDUFA8, NDUFC1, PPA1, COX8A, SDHD, UQCR10, NDUF56, SDHA, NDUF58, NDUF55, COX6C, ATP6AP1, NDUFB4, COX7A2L, COX5B, NDUFA3, NDUF53, COX7A2, COX17, COX5A, UQCRB, UQCR11, NDUFB2, UQCRQ, UQCRC1, NDUFA2, NDUFB8, NDUFA12, NDUFA6, COX7B, NDUFA9, NDUF2C, COX4I1, ATP6V1H, NDUFV3, NDUFAB1, ATP6V0D1, ATP6V0E1, NDUFB10, COX6A1, NDUFA1, NDUFB1, NDUFB3, ATP6V0A4, COX6B1, NDUFB5, LHPP, NDUFB6, ATP6V1F, NDUF54
Lysosome	1.5e-11	9.3e-10	- 2.318	121	CTSD, SCARB2, ACP2, LAPTM4B, CTSH, PSAP, TCIRG1, CTSZ, ARSA, AGA, LIPA, TPP1, LAMP1, CTSV, SUMF1, LITAF, SORT1, CTSO, HEXA, SMPD1, LAPTM4A, HGSNAT, CTSB, CTSL, ATP6AP1, CTSA, LGMN, GM2A, FUCA1, PPT1, GNS, GLB1, NAGPA, CD63, AP1S1, AP1B1, NAGA, PPT2, MANBA, ATP6V1H, ATP6V0D1, ARSB, CTNS, AP1G2, NEU1, GNPTG, AP3M1, ATP6V0A4, PLA2G15, NAGLU, DNASE2, ABCA2, AP3S2, IDUA
Proteasome	1.2e-11	9.3e-10	- 2.496	43	PSMA3, PSMD2, PSMD1, PSMA4, PSMC3, PSMA7, PSMC2, PSMB1, PSME1, PSME2, PSMA1, PSMF1, PSMB2, PSMD3, PSMA5, PSMB6, PSMD11, PSMD13, PSMB9, PSMB7, POMP, SEM1, PSMB8, PSMB5, PSMD7, ADRM1, PSMB3, PSMB4, PSMD4, PSMD14, PSMC5, PSME3, PSMC1
Ribosome	8.3e-07	4.3e-05	-1.98	129	MRPL23, MRPL11, MRPS16, RPS25, RPL7A, RPL34, MRPS9, MRPL16, MRPL15, MRPL1, RPS3A, MRPL28, MRPL35, MRPS18C, MRPL30, MRPL27, RPS24, MRPS11, MRPL33, RPS27A, MRPL20, RPL27A, RPS3, MRPL21, RPL26L1, MRPL19, RPSA, RPS20, MRPS7, FAU, MRPL12, MRPL14, RPS13, RPLP1, RPS7, MRPS2, MRPL3, RPL7, RPL23A, RPL9, RPL36AL, MRPS6, MRPS14, RPL31, MRPS18A, RPL35A, MRPS15, RPL29, MRPS5, RPS26, MRPL36, RPL19, RPS9, RPL3, RPL6

Oocyte meiosis	2.0e-06	7.7e-05	- 1.979	109	CCNB1, PPP3CB, PPP1CA, CALM2, YWHAZ, YWHAQ, CAMK2G, BUB1, CDC20, CUL1, PRKACB, MAD2L1, CCNB2, YWHAB, AURKA, PPP2R1A, PPP2R5D, ADCY6, RPS6KA2, PPP2R1B, PTTG1, CALM3, CDC16, PPP3CA, ANAPC2, PLK1, CDC25C, PPP2R5B, MAD2L2, RBX1, YWHAE, PPP2CB, SKP1, AR, MAPK12, RPS6KA1, BTRC, PRKACA, ADCY3, CDK1, PPP1CB, ANAPC10, CDC26, CAMK2D
Protein processing in endoplasmic reticulum	1.8e-06	7.7e-05	- 1.866	157	VCP, GANAB, PDIA4, CKAP4, CAPN1, PDIA6, MBTPS2, STT3A, HSPA8, HYOU1, RPN2, CALR, BCAP31, UBE2D4, UBE2D3, CAPN2, DNAJB12, NSFL1C, CUL1, SYVN1, PDIA3, MAN1B1, FBXO6, OS9, PREB, HSPA1B, RRBP1, ATF6B, SEC61A1, SEC61G, P4HB, LMAN2, TRAM1, HSP90B1, STUB1, SEC61B, SSR4, FBXO2, ERLEC1, UBE4B, SAR1A, SSR2, MAPK8, SEC24C, MOGS, SEC31A, RBX1, WFS1, TRAF2, DAD1, DDOST, SKP1, RNF5, SEC24D, UBE2G2, RPN1, SSR3, ERO1B, MBTPS1, UGGT1, DERL2, DNAJB11, EIF2AK1, SELENOS, DNAJC5, BAX
Huntington's disease	4.7e-06	1.6e-04	- 1.773	169	NDUFA4, POLR2L, PLCB3, POLR2G, NDUFV1, DCTN1, VDAC3, AP2M1, NDUFA8, NDUFC1, COX8A, SDHD, UQCR10, NDUFS6, SDHA, NDUFS8, NDUFS5, COX6C, POLR2J, NDUFB4, SLC25A4, COX7A2L, SOD1, COX5B, NDUFA3, NDUFS3, COX7A2, COX5A, UQCRB, UQCR11, NDUFB2, POLR2E, UQCRCQ, UQCRC1, NDUFA2, CREB3, NDUFB8, NDUFA12, CASP3, VDAC2, NDUFA6, COX7B, NDUFA9, NDUFC2, COX4I1, DNAH5, NDUFV3, NDUFAB1, PPIF, DCTN2, NDUFB10, COX6A1, AP2B1, NDUFA1, AP2A2, NDUFB1, SLC25A6, GPX1, TAF4, BAX, NDUFB3, COX6B1, NDUFB5, CASP8, NDUFB6, IFT57, NDUFS4, AP2A1, POLR2K
Vibrio cholerae infection	5.2e-06	1.6e-04	- 2.073	48	PDIA4, ATP6V0E2, TCIRG1, KCNQ1, PRKACB, ARF1, KDELR1, GNAS, SEC61A1, ATP6AP1, SEC61G, SEC61B, ACTB, ACTG1, ATP6V1H, ATP6V0D1, ATP6V0E1, PRKACA, ADCY3, KDELR2, ATP6V0A4, ATP6V1F
Fatty acid degradation	1.2e-05	2.4e-04	- 2.115	37	ADH5, HADH, ECHS1, HADHA, ACAT1, ALDH2, CPT2, ACSL1, ACADVL, ECI2, ALDH3A2, ACAA1, ACOX3, HADHB, CPT1A, ACAA2, ECI1
N-Glycan biosynthesis	9.1e-06	2.4e-04	-2.04	47	GANAB, STT3A, RPN2, DPAGT1, DOLK, ALG8, MAN1B1, MGAT3, B4GALT2, MOGS, ALG1, DAD1, DDOST, RPN1, MGAT4B, DPM2, MGAT1, FUT8, ALG6, ALG9, ST6GAL1
Phagosome	1.1e-05	2.4e-04	-1.85	135	HLA-B, ATP6V0E2, HLA-C, TUBB4B, C1R, TUBB, TCIRG1, HLA-A, CALR, TAP1, TUBA1C, HLA-DPA1, RAB5B, TUBA1B, ITGB5, LAMP1, RAC1, HLA-DQB1, SEC61A1, MRC2, CTSL, ATP6AP1, SEC61G, SEC61B, ACTB, VAMP3, PLA2R1, COLEC12, HLA-DPB1, ACTG1, RAB5C, ATP6V1H, ATP6V0D1, ATP6V0E1, DYNC1I2, RAB7B, HLA-DRB1, TUBB2A, ATP6V0A4, ATP6V1F, ITGA5, ITGB3
Retrograde endocannabinoid signaling	9.3e-06	2.4e-04	- 1.885	129	GNAI2, NDUFA4, PLCB3, NDUFV1, NDUFA8, NDUFC1, PRKACB, NDUFS6, NDUFS8, NDUFS5, ADCY6, NDUFB4, MAPK11, NDUFA3, NDUFS3, NDUFB2, GNB2, MAPK8, DAGLA, NDUFA2, GABRA3, NDUFB8, NDUFA12, NDUFA6, NDUFA9, NDUFC2, FAAH, NDUFV3, NDUFAB1, GNG11, MAPK12, GABRB3, NDUFB10, PRKACA, NDUFA1, ADCY3, NDUFB1, NDUFB3, GNGT1, NDUFB5, NDUFB6, GNG5, NDUFS4, CACNA1F, MAPK3
Ribosome biogenesis in eukaryotes	9.8e-06	2.4e-04	1.919	78	GNL3, GTPBP4, WDR43, RIOK1, WDR75, WDR3, LSG1, REXO1, UTP4, NVL, WDR36, NOP58, DKC1, XRN1, TCOF1, UTP14A, NXF1, NMD3, GNL2, RIOK2, CSNK2A1, UTP18, NXF3, RCL1, GNL3L, NOP56, UTP14C, MDN1, EFL1, FCF1, RPP38, NXT1, CSNK2A2, UTP15

MicroRNAs in cancer	4.8e-05	8.9e-04	1.688	165	VEGFA, DNMT1, DDIT4, PIM1, CDC25A, HMOX1, IRS2, SLC7A1, ZEB1, CCND2, MDM4, E2F2, MCL1, CRKL, VIM, BRCA1, TNXB, MMP16, PTGS2, SPRY2, IGF2BP1, CDKN1A, KRAS, EP300, MYC, GLS, RASSF1, NOTCH3, ROCK1, MDM2, APC, ABCB1, BCL2, RPS6KA5, E2F3, IRS1, MAP2K1, TNC, RAF1, SOX4, APC2, PIK3CA, ZEB2, CRK, TIMP3, DICER1, MIRLET7D
Non-alcoholic fatty liver disease (NAFLD)	4.3e-05	8.5e-04	- 1.786	135	NDUFA4, RXRA, NDUFV1, NDUFA8, NDUFC1, RAC1, COX8A, SDHD, UQCR10, NDUFS6, AKT1, MAP3K11, TNFRSF1A, SDHA, NDUFS8, NDUFS5, COX6C, NDUFB4, COX7A2L, COX5B, NDUFA3, NDUFS3, COX7A2, FAS, COX5A, UQCRB, NFKB1, UQCR11, NDUFB2, TGFB1, AKT3, MAPK8, UQCRQ, CDC42, UQCRC1, NDUFA2, NDUFB8, NDUFA12, CASP3, TRAF2, NDUFA6, COX7B, NDUFA9, NDUFC2, COX4I1, NDUFV3, NDUFAB1, IKBKB, NDUFB10,
Glutathione metabolism	6.8e-05	0.001	-1.98	44	GSTP1, GPX3, MGST2, SMS, G6PD, IDH1, GSTO1, TXNDC12, IDH2, LAP3, GSTK1, GGT1, GSTO2, GSS, GPX1, GSR, PGD, GGT7, GSTM4, GSTA4, RRM1, GSTM3, MGST1, GPX4, GGT6, GGCT
Antigen processing and presentation	1.0e-04	0.002	- 1.903	60	HLA-B, HLA-C, HSPA8, TAPBP, HLA-A, CALR, TAP1, HLA-DPA1, PSME1, PSME2, PDIA3, HSPA1B, CTSB, HLA-DQB1, CTSL, LGMN, B2M, RFXANK
Axon guidance	1.2e-04	0.002	- 1.677	170	CFL1, GNAI2, CDK5, PPP3CB, SEMA4F, RAC2, SSH3, SMO, RHOD, CAMK2G, UNC5B, NCK2, NRP1, RAC1, GDF7, ILK, HRAS, EFNA3, EFN3, WNT5B, NTN1, PAK1, PPP3CA, BMPR1B, FZD3, ABLIM2, UNC5C, CDC42, EPHB2, DPYSL5, DPYSL2, RHOA, SEMA4B, SEMA4G, EPHA1, LIMK1, RAC3, BOC, NTN4, PLXNB1, PRKCZ, CAMK2D, LIMK2, RGS3, PLXNA3, EFNA4, BMPR2, SEMA3B, EPHB3, TRPC3, ROBO3, EPHA6, MAPK3, NFATC4, SLIT2, WNT5A, NTN3, PARD6A, PLXNA1, SRC, ROBO1, PIK3CD
Transcriptional misregulation in cancer	1.6e-04	0.002	1.634	159	GADD45B, GADD45A, ETV1, DDIT3, PER2, NUPR1, CEBPB, ZEB1, CCND2, CXCL8, CCNT1, DDX5, CCNT2, DUSP6, BCL6, ETV5, RARA, KDM6A, PRCC, SP1, ELK4, MEF2C, CD14, SIX1, CDKN1A, NR4A3, ETV4, NFKBIZ, MYC, TCF3, PAX3, DOT1L, POLK, SIX4, JMJD1C, MDM2, GADD45G, CD86, ATF1, PTK2, MITF
Endocytosis	2.1e-04	0.003	- 1.524	241	HLA-B, HLA-C, ARFGAP2, HSPA8, CHMP3, ARF3, GRK2, HLA-A, RAB5B, AP2M1, ARAP1, CHMP6, VPS26B, UBB, ARF1, RAB4A, SNF8, ARF5, ARRB1, FGFR3, HRAS, LDLRAP1, HSPA1B, CAPZB, ASAP3, VPS26A, PSD4, FOLR1, AGAP3, ZFYVE27, TSG101, FGFR2, CAV2, RAB31, CAV1, CDC42, ASAP2, RAB11A, RHOA, RAB11FIP3, SNX1, VPS37C, ARPC2, CHMP2A, RAB5C, CAPZA2, MVB12A, VPS25, VPS36, VPS4A, SNX12, VPS29, AP2B1, GRK4, AP2A2, EHD3, CHMP4C, EHD1, WASHC2C, CYTH2, ARPC4, PRKCZ, RAB11FIP1, PLD2, RAB22A, ARPC3, BIN1, CHMP4B, WASHC2A, PIP5K1C, ARPC1A, RAB8A, CHMP7, SMAD2, AP2A1, WIPF3, CYTH3, MVB12B, CHMP5, RAB11B, LDLR, PARD6A, HLA-E, CHMP1A, SRC, GRK5
Gastric acid secretion	2.7e-04	0.004	- 1.787	68	GNAI2, KCNQ1, PLCB3, CALM2, SLC4A2, CAMK2G, CCKBR, PRKACB, GNAS, ADCY6, CALM3, ACTB, SSTR2, ATP1B2, PRKACA, ADCY3, CA2, CAMK2D
Peroxisome	2.7e-04	0.004	- 1.834	83	CAT, CRAT, PEX2, ACSL1, PRDX1, PEX19, GNPAT, EC12, PEX10, SOD1, IDH1, PMVK, ABCD1, ACAA1, IDH2, ACOX3, GSTK1, PRDX5, MVK, PEX11B, SCP2, PEX7, PECR, CROT, ABCD4, SLC25A17, PEX26, PEX16
Sphingolipid signaling pathway	4.1e-04	0.005	- 1.681	116	CTSD, GNAI2, RAC2, PPP2R2C, PLCB3, SGPL1, RAC1, HRAS, AKT1, SMPD1, TNFRSF1A, PPP2R1A, PPP2R5D, PPP2R1B, PTEN, MAPK11, NFKB1, GNA12, AKT3, MAPK8, DEGS1, PPP2R5B, CERS5, RHOA, TRAF2,

					PPP2R3B, PPP2CB, CERS2, SGMS1, MAPK12, CERS1, SPTLC3, RAC3, BID, PRKCZ, ADORA1, NOS3, BAX, PLD2
Citrate cycle (TCA cycle)	5.8e-04	0.006	- 1.851	29	MDH1, PDHB, SDHD, SDHA, IDH1, OGDH, SUCLG1, IDH2, DLAT, MDH2, FH, IDH3G, CS, ACO2, PDHA1, IDH3A
Focal adhesion	4.9e-04	0.006	- 1.531	197	LAMB3, COL6A1, VEGFB, PARVA, COL2A1, RAC2, PPP1CA, LAMB2, CAPN2, COL6A2, COL4A2, ITGA3, ITGB5, RAC1, ILK, HRAS, PARVB, AKT1, BAD, LAMA5, COL1A1, PTEN, PDGFA, PDGFC, ITGA7, CAV2, PAK1, ACTB, CAV1, COL4A1, AKT3, MAPK8, CDC42, CCND1, ERBB2, COL9A2, RHOA, COL4A5, ACTG1, VAV2, ITGB4, SHC1, EGF, MYL9, MYL12B, PXN, LAMB1, RAC3, FLNA, PPP1CB, COL4A4, VAV1, ITGB8, PIP5K1C, FLT1, ITGA5, ITGB3, MAPK3, COL9A3, FN1, PDGFD, ITGA11, TLN1, LAMC3, BIRC2, VCL, SRC
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	6.2e-04	0.006	- 1.933	20	B3GALT6, CHPF2, B3GAT3, CHST14, CHST15, CHPF, B4GALT7, CHST11, CSGALNACT1, CHST12, CHST3, UST, XYLT2, CHSY1, CHST7
Protein export	4.9e-04	0.006	- 1.901	23	SPCS2, SRP9, SEC61A1, SEC61G, SEC61B, SPCS3, SEC11C, SEC11A, SRP72, SPCS1, SRP14, IMMP2L, OXA1L
Tryptophan metabolism	6.4e-04	0.006	-1.85	37	HADH, ECHS1, CAT, HADHA, ACAT1, ALDH2, MAOB, OGDH, CYP1B1, ALDH3A2
Fatty acid elongation	7.0e-04	0.007	- 1.866	25	HADH, ECHS1, HADHA, HSD17B12, PPT1, HACD4, HADHB, ELOVL6, PPT2, HACD3, ELOVL1, ACAA2, HACD1
Progesterone-mediated oocyte maturation	8.5e-04	0.008	- 1.701	88	CCNB1, GNAI2, CCNA2, BUB1, PRKACB, MAD2L1, CCNB2, AKT1, CDC25B, AURKA, ADCY6, RPS6KA2, MAPK11, CDC16, AKT3, MAPK8, ANAPC2, PLK1, CDC25C, CCNA1, MAD2L2, PDE3B, MAPK12, RPS6KA1, PRKACA, ADCY3, CDK1, ANAPC10, CDC26, ARAF
RNA transport	8.0e-04	0.008	1.548	162	EIF4A2, RNPS1, EIF3H, DDX39B, XPOT, EIF3D, EIF2S1, EIF5, EIF3A, EIF4B, NUP153, NUP58, TPR, PNN, DDX20, RAE1, CASC3, PABPC4, SEH1L, NUP155, NXF1, NMD3, EIF2B2, NUP107, NUP50, NUP214, NXF3, NUP62, THOC1, UPF2, PRMT5, THOC2, EIF4G1, NUP205, SRRM1, CYFIP1, EIF1B, NUP98, KPNB1, NUP43, EIF4A1, EEF1A2, MAGOH, EIF1, RPP38, RANBP2, NUP210L, CYFIP2, EIF3C, NUP35, SMN2, SMN1, NXT1, GEMIN5, NUP85, PHAX, UPF1, NCBP1, FXR1, SENP2, TGS1
Base excision repair	0.001	0.01	- 1.799	33	PARP1, NEIL1, POLE4, POLD2, SMUG1, FEN1, POLB, MPG, NEIL3, POLD4, PARP3, NTHL1, LIG3, HMGB1
Metabolism of xenobiotics by cytochrome P450	0.001	0.01	- 1.786	40	ADH5, GSTP1, MGST2, EPHX1, CYP1B1, GSTO1, GSTK1, CBR1, GSTO2, CBR3, GSTM4, GSTA4, ALDH3B1, GSTM3, MGST1, ALDH1A3

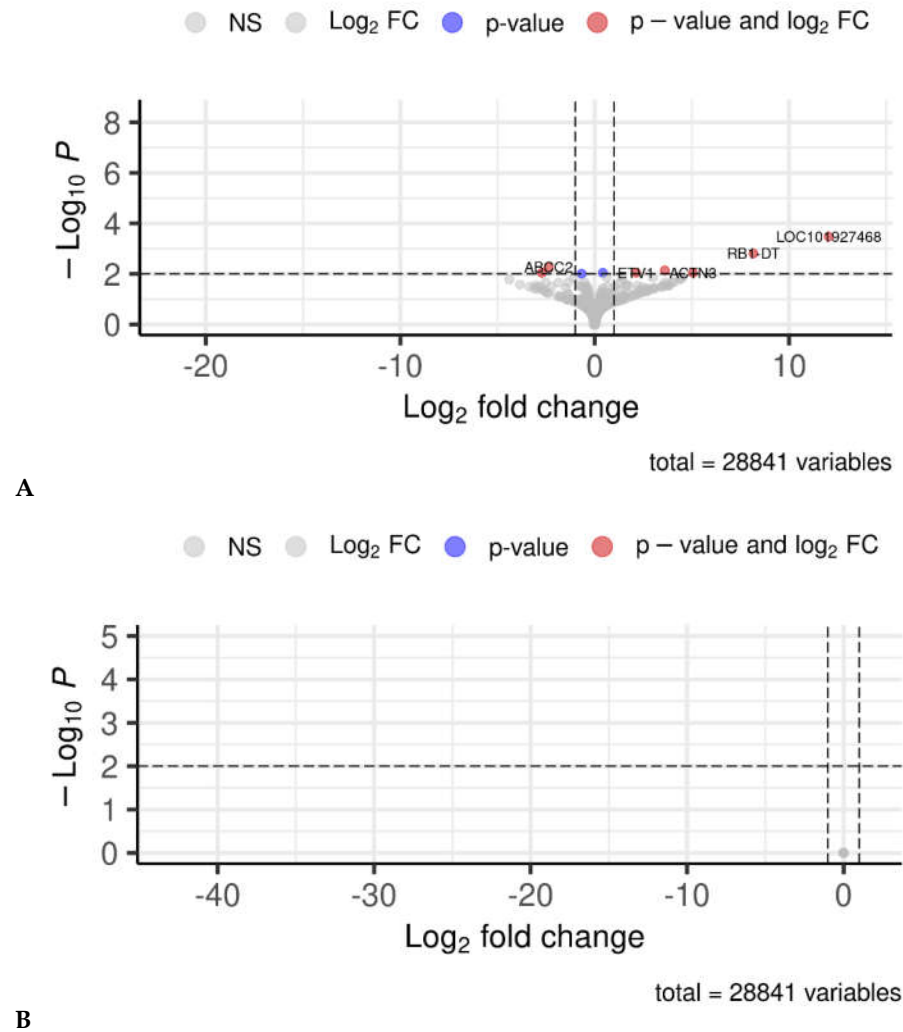


Figure S2. DMSO effect on WT (A) and PARP1-KO (B) cells. Volcano Plot for differential gene expression in cells treated with 0.1% DMSO vs untreated cells.

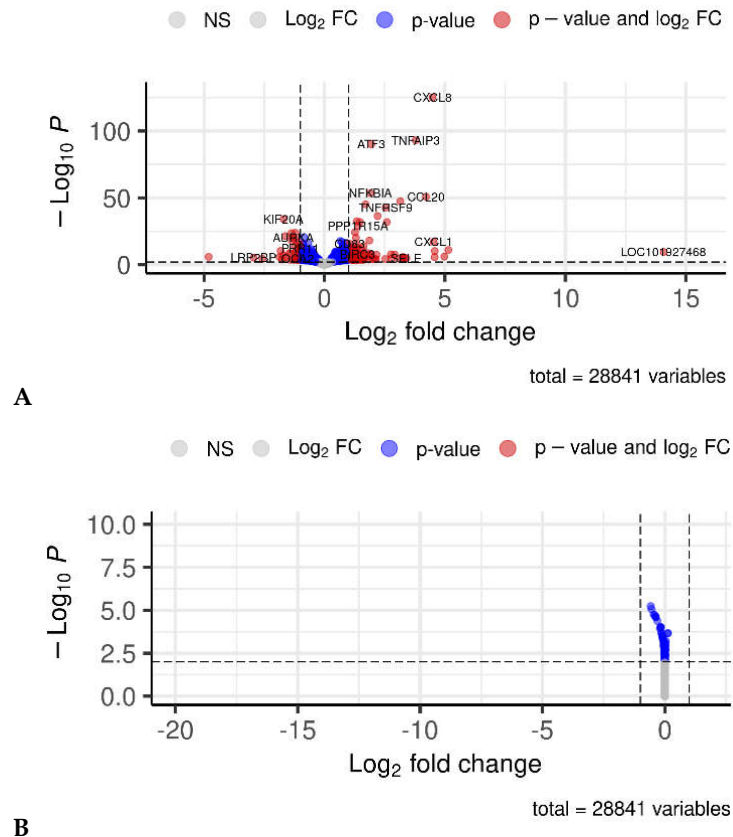


Figure S3. Topotecan effect on A) WT HEK293A cells treated with 100 nM Tpc vs untreated cells; B) PARP1-KO HEK293A cells treated with 50 nM Tpc vs untreated cells. Volcano Plots for differential gene expression under the influence of topotecan.

Table S2. Gene set enrichment analysis results of topotecan effect on gene expression: pathways significantly associated with differentially expressed genes upon treatment with topotecan plus DMSO or only DMSO (WT HEK293A cells treated with 100 nM Tpc + 0.1% DMSO vs cells treated with 0.1% DMSO).

Pathway	<i>p</i> -Value	<i>p</i> -adj	NES	Number	Genes
Ribosome	7.3e-24	2.3e-21	- 2.865	129	MRPS9, RPL35, RPS27L, RPL7A, RPL19, RPL29, MRPL33, RPL38, MRPL23, UBA52, RPL24, RPLP0, FAU, RPS12, RPL27A, RPS3A, RPL35A, RPL36AL, RPS4X, RPL5, RPS19, RPL22, MRPL11, MRPL14, RPS25, RPS8, RPS6, RPL21, RPL37, RPS14, RPL3, RPS24, RPS7, RPL11, MRPL9, RPL23A, RPL31, RPL23, RPL13, RPS5, RPL34, RPL41, RPL6, RPL12, RPS11, RPL14, RPS2, RPS27A, MRPL27, RPL27, RPSA, RPL36, RPS18, RPLP1, RPS26, RPL13A, RPL37A, RPS27, RPL15, MRPL1, MRPL12, RPL10, RPL4, MRPL13, MRPL4, RPLP2, RPS23, RPS13, RPL8, RPL18, RPS20, RPL9, RPL10A, RPL32, MRPL28, RPL7, RPS16, MRPS14, RPS15A, MRPL35, MRPL21, RPL39, MRPS18A, MRPS5, MRPL24, RPS3, MRPL30
Oocyte meiosis	1.3e-14	2.0e-12	- 2.513	109	CCNB1, CDC20, PLK1, AURKA, BUB1, CCNB2, CALM2, CDK1, PTTG1, PPP2R5C, YWHA E, PPP3CB, PPP2R5E, CDC25C, YWHAB, YWHA Z, PPP3CA, CUL1, PPP2R5D, SPDYA, CAMK2D, ANAPC5, CALM3, ANAPC11, ANAPC10, IGF1R, PPP2R1A, PPP1CB, REC8, ADCY6, SMC1B, PRKACB, RBX1, MAD2L2, PPP1CA, YWHA Q, MAD2L1, SKP1, PPP2CA, CDC26, ESPL1, BTRC, CDC16
TNF signaling pathway	8.5e-14	8.9e-12	2.517	106	TNFAIP3, NFKBIA, CCL20, JUN, CXCL1, CREB5, JUNB, CXCL10, CXCL2, NFKB1, BIRC3, CXCL3, ICAM1, RELA, SELE, BIRC2, MAP3K14, CEBPB, LIF, TNF, CASP3, MAP3K8, TRAF1, FOS, CSF1, CHUK, CCL2, BCL3, CREB1, FAS, CASP10, JAG1, PIK3R1, VCAM1, TRAF3
IL-17 signaling pathway	5.9e-13	3.7e-11	2.527	85	CXCL8, TNFAIP3, NFKBIA, CCL20, JUN, CXCL1, CXCL10, CXCL2, NFKB1, CXCL3, FOSL1, RELA, CEBPB, TNF, CASP3, JUND, TRAF4, FOS, TRAF3IP2, CHUK, CCL2, FOSB
Oxidative phosphorylation	4.7e-13	3.7e-11	2.479	98	NDUFB4, ATP6V0E2, NDUFAB1, COX7A2, ATP6V1H, NDUFA9, UQCRI1, ATP6V1E1, NDUFS5, NDUFB10, ATP6V0E1, COX7B, UQCRCQ, NDUFB3, NDUFA12, NDUFA3, COX5A, COX6B1, COX6C, NDUFA4, PPA2, NDUFB5, COX4I1, NDUFB9, NDUFS4, UQCRI0, NDUFS6, NDUFB2, TCIRG1, NDUFA2, COX7C, COX5B, SDHC, UQCRC1, UQCRC2, NDUFA8, COX17, NDUFB6, NDUFC1, SDHB, NDUFB11, NDUFV1, ATP6V0A4, NDUFB1, COX6A1, NDUFS8, ATP6V0D1, NDUFA1, UQCRC1, NDUFA5, COX8A, ATP6V1G1, NDUFA6, NDUFA10
NF-kappa B signaling pathway	1.8e-12	8.9e-11	2.479	86	CXCL8, TNFAIP3, NFKBIA, RELB, PLA U, GADD45B, NFKB2, CXCL2, NFKB1, BIRC3, ICAM1, RELA, TICAM1, CCL4, BIRC2, MAP3K14, TNF, BCL2, TRAF1, CHUK, PIAS4, BTK, TIRAP, ZAP70, TRAF6, VCAM1, TRAF3, MAL T1, BCL10, LCK
Parkinson's disease	2.0e-12	8.9e-11	- 2.396	109	NDUFB4, UBE2L3, NDUFAB1, COX7A2, NDUFA9, UQCRI1, NDUFS5, NDUFB10, COX7B, GNAI2, SNCA, UQCRCQ, NDUFB3, UBE2L6, NDUFA12, NDUFA3, COX5A, PAK7, COX6B1, COX6C, UBB, NDUFA4, NDUFB5, GNAI3, COX4I1, NDUFB9, NDUFS4, UQCRI0, NDUFS6, UCHL1, NDUFB2, VDAC1, NDUFA2, PRKACB, COX7C, COX5B, SDHC, UBE2G1, UQCRC1, PRKN, UQCRC2, NDUFA8, NDUFB6, NDUFC1, SDHB, VDAC3, NDUFB11, NDUFV1, NDUFB1, COX6A1, NDUFS8, UBE2G2, NDUFA1, UQCRC1, NDUFA5, COX8A, NDUFA6, GNAI1, NDUFA10, VDAC2, SLC25A5, COX7A2L, GNAI1
Alzheimer's disease	3.9e-11	1.5e-09	- 2.261	144	CALM2, NDUFB4, PPP3CB, ATF6, NDUFAB1, GSK3B, COX7A2, NDUFA9, PPP3CA, CACNA1F, UQCRI1, NDUFS5, NDUFB10, COX7B, SNCA, UQCRCQ, NDUFB3, RTN3, PLCB1, NDUFA12, GNAQ, HSD17B10, NDUFA3,

					COX5A, COX6B1, COX6C, ATP2A1, NDUFA4, GAPDH, CALM3, NDUFB5, CDK5, COX4I1, NDUFB9, NDUFS4, UQCRI0, NDUFS6, CAPN2, APBB1, MME, NDUFB2, NDUFA2, CAPN1, COX7C, COX5B, SDHC, UQCRH, UQCRC2, NDUFA8, NDUFB6, NDUFC1, SDHB, BACE1, NDUFB11, NDUFV1, PSENEN, NDUFB1, COX6A1, NDUFS8, NDUFA1, UQCRC1, NDUFA5, COX8A, CACNA1S
NOD-like receptor signaling pathway	5.0e-10	1.7e-08	2.19	144	CXCL8, TNFAIP3, NFKBIA, JUN, CXCL1, GABARAPL1, CXCL2, NFKB1, BIRC3, CXCL3, RIPK2, RELA, TICAM1, DHX33, BIRC2, TNF, IRF7, MFN2, BCL2, OAS3, ANTXR2, CHUK, CCL2, TP53BP1, GBP1, PANX1, NLRX1, ATG12, TRAF6, OAS2, STAT1, NAMPT, TRIP6, TRAF3
Progesterone-mediated oocyte maturation	9.2e-09	2.9e-07	- 2.261	88	CCNB1, PLK1, AURKA, BUB1, CCNA2, CCNB2, CDK1, CDC25C, CDC25B, AKT3, HSP90AA1, GNAI2, SPDYA, PIK3CB, ANAPC5, CCNA1, HSP90AB1, ANAPC11, ANAPC10, KIF22, GNAI3, IGF1R, ADCY6, MAPK11, PRKACB, MAD2L2, MAD2L1, PDE3B, CDC26, CDC16, CDC27, ARAF, RPS6KA1, MAD1L1, SPDYC, ADCY3
Protein processing in endoplasmic reticulum	1.0e-08	2.9e-07	- 2.046	157	DNAJB1, HSPA1B, HSPA8, HSPA5, ATF6, VCP, BCAP31, UBE2D2, DNAJC1, RAD23B, SEC61G, CUL1, RPN1, PDIA3, HSP90AA1, HSP90B1, ERLEC1, RPN2, ERO1A, CALR, SEC63, STT3B, SSR2, NSFL1C, HSP90AB1, DAD1, RNF5, SSR3, PDIA6, STUB1, DNAJC3, SSR4, SIL1, CAPN2, BAX, SEC61B, OS9, SEC23B, RBX1, CAPN1, TUSC3, FBXO2, LMAN2, UBE2G1, TRAM1, SKP1, PRKCSH, PRKN, UBE2D4, SEC13, HSPBP1, P4HB, DNAJB2, MAN1B1, UFD1, PDIA4, HYOU1, SEC61A1, UBE2G2, UBQLN1, SSR1, PREB, CKAP4, ERP29, UBE4B, YOD1, DNAJA2
Cytokine-cytokine receptor interaction	2.3e-08	6.1e-07	1.98	203	CXCL8, CCL20, TNFRSF9, CXCL1, VEGFA, BMP2, CXCL10, CXCL2, TNFRSF12A, CXCL3, INHBA, CCL4, LIF, TNF, TNFRSF10B, IL1A, IL6ST, INHBE, IL10RA, IFNLR1, HGF, TNFRSF10A, CSF1, TNFRSF8, IL11, OSMR, CCL2, EGFR, TGFB2, IL7R, FLT1, CXCL11, IL18RAP, FLT4, CCR7, IL12A, FAS, CD70, PDGFB, TNFRSF10C, ACVR2B, CXCR2, EDA2R, TGFB2, KITLG, CNTF, IL1B, IFNGR2, PRLR, TNFSF9, ACVR1B, CCR4, CD40, IL12B, IL1R2, XCL1, OSM, FLT3LG, PDGFRB, CTF1, GDF5, IL17D, IL4R, CXCR4, IL1RAP, IFNAR1, IL1R1, IL18R1, CSF2RB, CCL8, IL12RB2, VEGFC, NGFR, CX3CL1, CXCL6, RELT, IL20RA, LTA
Endocytosis	9.1e-08	2.1e-06	- 1.803	241	PARD3, HSPA1B, AGAP1, HSPA8, RAB7A, SH3KBP1, SNX1, RHOA, CDC42, CHMP5, ARPC2, SNF8, SMAP1, RAB11A, RAB8A, CHMP2A, RAB5B, CAPZB, RAB5C, AP2B1, HRAS, ACAP1, MDM2, SRC, VPS29, UBB, AP2M1, CHMP2B, ARF1, SNX12, VPS28, PIP5K1C, VPS25, ASAP3, RAB11B, IGF1R, ASAP1, CLTB, SNX3, CHMP4B, ARFGAP3, RAB22A, SNX2, FOLR1, CAPZA2, PARD6A, GRK5, WASHC5, VTA1, WASHC2C, ARPC3, KIF5B, RABEP1, CHMP3, WAS, WASHC3, CLTA, ARRB2, CLTC, SNX32, HLA-A, CAV2, PSD3, SNX6, WIPF2, RAB4A, WASHC1, ARF3, SMAD2, SNX4, ARPC1B, STAM, EPS15, PLD1, VPS35, PDCD6IP, TSG101, CHMP6, ARF5, CYTH2, ARPC1A, RUFY1, EPN3, RAB31, EHD3, HLA-B, EPS15L1, IQSEC3, CBLC, LDLR, VPS26B, MVB12A, ARAP1
Retrograde endocannabinoid signaling	9.3e-08	2.1e-06	- 2.037	129	NDUFB4, GRIA4, NDUFAB1, NDUFA9, CACNA1F, NDUFS5, NDUFB10, GNB1, GNAI2, NDUFB3, PLCB1, NDUFA12, GNAQ, PRKCA, NDUFA3, MGLL, NDUFA4, NDUFB5, GNG7, GNAI3, GNG5, NDUFB9, NDUFS4, NDUFS6, NDUFB2, ADCY6, MAPK11, NDUFA2, PRKACB, GNGT1, NDUFA8, NDUFB6, NDUFC1, NDUFB11, NDUFV1, NDUFB1, NDUFS8, NDUFA1, NDUFA5, CACNA1S, ADCY3, CACNA1B, NDUFA6, GNG13, NDUFA10, GABRB3, GNG12, GNAI1, GNB2
Osteoclast differentiation	1.1e-07	2.3e-06	2.061	117	NFKBIA, RELB, JUN, NFKB2, JUNB, NFKB1, FOSL1, FOSL2, SQSTM1, RELA, NFATC1, MAP3K14, TNF, CYLD,

					IL1A, FHL2, JUND, MITF, FOS, NFATC2, CSF1, CHUK, FOSB, TGFB2, BTK, SOCS1, CREB1, FCGR2B, TRAF6, PIK3R1, STAT1, TGFB2, LCK, GAB2, PIK3CD, IL1B
Proteasome	1.6e-07	3.2e-06	- 2.249	43	PSME2, PSMF1, PSMD1, PSMB1, PSMA5, POMP, PSMB2, PSMD14, PSMA3, PSMD4, PSMB6, PSMC1, PSMB3, PSMA7, PSMD7, PSMD8, PSMD12, PSMA4, SEM1, PSMC6, PSMC3, PSME1, PSMB7, PSMD6, PSMD11, PSMB5, PSME4, PSMC2
Kaposi's sarcoma-associated herpesvirus infection	4.2e-07	7.8e-06	1.939	166	CXCL8, NFKBIA, JUN, CXCL1, GABARAPL1, VEGFA, CXCL2, NFKB1, RCAN1, CXCL3, ICAM1, MICB, RELA, TICAM1, NFATC1, TP53, CASP3, HLA-E, E2F1, E2F2, IL6ST, IRF7, FOS, EP300, NFATC2, JAK2, MYC, CHUK, GNB5, EIF2AK2, RAF1, CCND1, NFATC3, CREB1, ZFP36, FAS, PDGFB, PIK3R1, STAT1
Vibrio cholerae infection	1.7e-06	3.0e-05	- 2.167	48	ATP6V0E2, KCNQ1, KDELR1, ATP6V1H, SEC61G, ATP6V1E1, ATP6V0E1, GNAS, ERO1A, PRKCA, ARF1, PLCG2, SEC61B, TCIRG1, PRKACB, CFTR, ATP6V0A4, PDIA4, ACTB, SEC61A1, ATP6V0D1, ATP6V1G1, ADCY3
Toll-like receptor signaling pathway	2.1e-06	3.4e-05	2.069	83	CXCL8, NFKBIA, JUN, CXCL10, NFKB1, RELA, TICAM1, CCL4, TNF, MAP3K8, IRF7, FOS, CHUK, CXCL11, TIRAP, TLR5, IL12A, TRAF6, PIK3R1, STAT1, TRAF3
RIG-I-like receptor signaling pathway	2.5e-06	4.0e-05	2.157	55	CXCL8, NFKBIA, CXCL10, NFKB1, RELA, TNF, CYLD, MAP3K1, IRF7, CHUK, IFIH1, NLRX1, ATG12, IL12A, CASP10, TRAF6, TRAF3, AZI2, NFKBIB, RNFI25, RIPK1, IL12B
Rheumatoid arthritis	3.7e-06	5.5e-05	2.025	76	CXCL8, CCL20, JUN, CXCL1, VEGFA, ICAM1, TNF, IL1A, HLA-DRB5, FOS, CSF1, IL11, CCL2, TGFB2, HLA-DMA, FLT1
Malaria	4.3e-06	6.1e-05	2.131	36	CXCL8, ICAM1, SELE, TNF, THBS1, THBS2, HGF, CCL2, TGFB2, HBA2, IL12A, VCAM1, IL1B, CD40, HBA1
Hepatitis B	5.9e-06	7.7e-05	1.927	128	CXCL8, NFKBIA, JUN, CREB5, NFKB1, STAT4, RELA, TICAM1, NFATC1, TP53, TNF, CASP3, E2F1, E2F2, MAP3K1, IRF7, SMAD3, BCL2, FOS, EP300, NFATC2, MYC, CHUK, TGFB2, IFIH1, TIRAP, RAF1, CCND1, NFATC3, CREB1, EGR2, EGR3, FAS, STAT5A, CASP10, PIK3R1, STAT1
Herpes simplex infection	5.7e-06	7.7e-05	1.845	166	NFKBIA, JUN, NFKB1, PER2, RELA, TICAM1, TP53, TNF, CASP3, HLA-E, SRSF6, PER1, NXF1, IRF7, TAF4B, HLA-DRB5, SRSF7, NXF3, TRAF1, FOS, OAS3, EP300, JAK2, TAF5L, GTF2IRD1, HCFC2, CHUK, SRSF5, CCL2, EIF2AK2, POLR2A, HLA-DMA, IFIH1, TAP1, IL12A, FAS, TRAF6, SRSF1, OAS2, STAT1, TRAF3, TAF13, SRPK1, PTPN11, EIF2AK3, HCFC1, IL1B, NFKBIB, IFNGR2
Legionellosis	7.2e-06	9.0e-05	2.095	50	CXCL8, NFKBIA, CXCL1, NFKB2, CXCL2, NFKB1, CXCL3, RELA, HSPA1L, TNF, CASP3
Measles	9.0e-06	1.1e-04	1.907	113	TNFAIP3, NFKBIA, NFKB1, RELA, TP53, HSPA1L, TNFRSF10B, CCND2, BBC3, IL1A, IRF7, OAS3, TNFRSF10A, JAK2, CHUK, RAB9A, EIF2AK2, IFIH1, RCHY1, CCND1, CD3G, FCGR2B, IL12A, FAS, STAT5A, TNFRSF10C, TRAF6, PIK3R1, OAS2, STAT1, CCND3, PIK3CD, EIF2AK3, CDK6, IL1B, NFKBIB, ADAR, IFNGR2
Influenza A	1.1e-05	1.2e-04	1.843	150	CXCL8, NFKBIA, JUN, CXCL10, NFKB1, ICAM1, RELA, TICAM1, HSPA1L, DDX39B, TNF, TNFRSF10B, NXF1, IL1A, IRF7, HLA-DRB5, NXF3, OAS3, NXT1, EP300, TNFRSF10A, JAK2, BCL2L2-PABPN1, CCL2, EIF2AK2, HLA-DMA, IVNS1ABP, IFIH1, RAF1, NLRX1, IL12A, FAS, CPSE4, TNFRSF10C, PIK3R1, OAS2, STAT1
HTLV-I infection	1.4e-05	1.6e-04	1.686	245	ATF3, NFKBIA, RELB, JUN, NFKB2, EGR1, NFKB1, ETS1, POLD3, FOSL1, ICAM1, CDKN2B, RELA, NFATC1, MAP3K14, TP53, ETS2, TNF, HLA-E, E2F1, MSX2, CCND2, E2F2, MAP3K1, SMAD3, HLA-DRB5, TERT, FOS, CHEK1, EP300, NFATC2, POLE3, MYC, CHUK, POLE, WNT11, TGFB2, HLA-DMA, ATR, APC2, SRF, CCND1, NFATC3, CD3G, CREB1, POLE2, EGR2, ZFP36, CREM, FZD8, PDGFB, STAT5A, WNT2B, PIK3R1

Huntington's disease	2.2e-05	2.4e-04	- 1.743	169	NDUFB4, DNAH3, NDUFAB1, COX7A2, NDUFA9, UQCRI1, NDUFS5, NDUFB10, COX7B, UQCRCQ, SOD1, NDUFB3, PLCB1, AP2B1, NDUFA12, GNAQ, NDUFA3, COX5A, COX6B1, COX6C, NDUFA4, AP2M1, NDUFB5, HDAC2, COX4I1, NDUFB9, NDUFS4, UQCRI10, NDUFS6, CLTB, DCTN2, REST, BAX, NDUFB2, VDAC1, POLR2J, NDUFA2, PPARG, POLR2E, COX7C, POLR2G, COX5B, HDAC1, SDHC, UQCRH, UQCRC2, CLTA, NDUFA8, CLTC, NDUFB6, NDUFC1, SDHB, VDAC3, NDUFB11, NDUFV1, NDUFB1, CREB3L4, COX6A1, NDUFS8, DNAI1, NDUFA1, POLR2L, UQCRC1, NDUFA5, COX8A, DNAH5, NDUFA6, NDUFA10, VDAC2, POLR2K, SLC25A5, COX7A2L, IFT57
DNA replication	3.2e-05	3.4e-04	2.04	36	POLD3, MCM4, RFC3, MCM7, RFC5, RNASEH1, MCM3, MCM2, LIG1, RFC2, POLE3, DNA2, POLE, MCM5, POLE2
Dopaminergic synapse	6.7e-05	6.7e-04	- 1.781	123	CALM2, PPP2R5C, PPP3CB, PPP2R5E, GRIA4, GSK3B, PPP3CA, AKT3, GNB1, GNAI2, MAOB, GNAS, PPP2R5D, CAMK2D, PLCB1, GNAQ, PRKCA, ATF2, CALM3, GNG7, GNAI3, GNG5, PPP2R1A, PPP2R2B, PPP1CB, MAPK11, PRKACB, GNGT1, PPP1CA, COMT, KIF5B, PPP2CA, ARRB2, MAOA, CREB3L4, CACNA1B, PPP2R2C, GNAL, GNG13, GSK3A, GNG12, GNAI1, LRTOMT, GNB2, PPP2R5A, PPP1CC, PPP2R3A, PPP2R2D, PLCB3, ITPR2, PRKCG, PLCB4
Leishmaniasis	6.8e-05	6.7e-04	1.986	65	NFKBIA, JUN, NFKB1, RELA, TNF, IL1A, HLA-DRB5, FOS, JAK2, TGFB2, HLA-DMA, IL12A, TRAF6, STAT1, NOS2, IL1B, NFKBIB, IFNGR2, IL12B
Small cell lung cancer	7.5e-05	7.1e-04	1.857	92	NFKBIA, GADD45A, GADD45B, NFKB1, BIRC3, CDKN2B, RELA, BIRC2, TP53, CASP3, E2F1, E2F2, BCL2, TRAF4, TRAF1, MYC, CHUK, POLK, ITGAV, CCND1, GADD45G, TRAF6, PIK3R1, TRAF3, ZBTB17, NOS2, PIK3CD, ITGA6, CDK6
Vascular smooth muscle contraction	7.8e-05	7.1e-04	- 1.756	107	PRKG1, CALM2, RHOA, CACNA1F, GNAS, PLCB1, GNAQ, PRKCA, CALM3, MYL6B, AGTR1, MYLK2, MYL6, MAP2K2, PLA2G6, PPP1CB, ACTA2, RAMP1, RAMP2, ADCY6, PRKACB, PPP1CA, MYL9, PRKCE, EDNRA, ARAF, CACNA1S, ADCY3, KCNMA1, PLA2G12A, PPP1CC, PPP1R12B, PLCB3, ITPR2, MRV11, PRKCG, PLCB4, PLA2G4A
Inflammatory bowel disease (IBD)	9.5e-05	8.2e-04	1.952	56	JUN, NFKB1, STAT4, RELA, NFATC1, TNF, IL1A, SMAD3, HLA-DRB5, FOXP3, TGFB2, HLA-DMA, IL18RAP, TLR5, IL12A, TBX21, STAT1
Th1 and Th2 cell differentiation	9.1e-05	8.2e-04	1.857	86	NFKBIA, JUN, NFKB1, STAT4, RELA, NFATC1, NFKBIE, HLA-DRB5, FOS, NFATC2, JAK2, CHUK, HLA-DMA, NFATC3, NOTCH1, CD3G, IL12A, DLL4, TBX21, ZAP70, STAT5A, JAG1, STAT1, LCK, CD4, NFKBIB, IFNGR2, MAML1
Th17 cell differentiation	9.7e-05	8.2e-04	1.821	99	NFKBIA, JUN, NFKB1, RELA, NFATC1, NFKBIE, IL6ST, SMAD3, RUNX1, HLA-DRB5, FOS, AHR, NFATC2, JAK2, CHUK, IL27RA, FOXP3, HLA-DMA, NFATC3, CD3G, RARA, TBX21, ZAP70, STAT5A, STAT1, IRF4, TGFB2, LCK, CD4, IL1B, NFKBIB, IFNGR2
AGE-RAGE signaling pathway in diabetic complications	1.3e-04	0.001	1.862	98	CXCL8, JUN, VEGFA, EGR1, NFKB1, ICAM1, PIM1, RELA, NFATC1, SELE, F3, TNF, CASP3, IL1A, SMAD3, BCL2, JAK2, CCL2, TGFB2, CCND1, STAT5A, PIK3R1, STAT1, VCAM1, TGFB2
Apoptosis	1.3e-04	0.001	1.744	130	NFKBIA, JUN, GADD45A, GADD45B, NFKB1, PMAIP1, BIRC3, RELA, BIRC2, MAP3K14, TP53, MCL1, TNF, CASP3, TNFRSF10B, BBC3, HRK, BCL2, CASP2, TRAF1, FOS, TNFRSF10A, CHUK, BCL2L11, RAF1, FAS, NTRK1, GADD45G, TNFRSF10C, CASP10, PIK3R1
Bladder cancer	1.4e-04	0.001	1.981	40	CXCL8, VEGFA, RASSF1, TP53, E2F1, E2F2, THBS1, MYC, TYMP, EGFR, HBEGF, RAF1, CCND1

Cytosolic DNA-sensing pathway	1.3e-04	0.001	1.977	43	NFKBIA, CXCL10, NFKB1, RELA, CCL4, IRF7, CGAS, POLR3A, CHUK, POLR3D, POLR3F, CASP1, POLR1C, POLR3C, POLR2H, IL1B, NFKBIB, ADAR, RIPK1, IKKBK, POLR3K
MAPK signaling pathway	1.3e-04	0.001	1.592	286	RELB, JUN, GADD45A, DUSP1, VEGFA, GADD45B, NFKB2, NFKB1, DUSP3, EPHA2, DUSP16, EFNA1, RELA, DUSP8, NFATC1, MAP3K14, TP53, HSPA1L, TNF, CASP3, DUSP10, CACNB1, DUSP6, DUSP5, CACNA1E, MAP3K8, RASGRP2, IL1A, MAP3K1, CACNB4, JUND, FOS, CACNG7, HGF, CSF1, MYC, CHUK, CRKL, EGFR, TGF2, FLT1, FLT4, DUSP4, RAF1, SRF, PLA2G4D, NFATC3, FGF17, FAS, MKNK2, NTRK1, PDGFB, GADD45G, TRAF6
Pathways in cancer	1.5e-04	0.001	1.449	495	CXCL8, NFKBIA, JUN, GADD45A, VEGFA, BMP2, GADD45B, NFKB2, NFKB1, PMAIP1, ETS1, BIRC3, PIM1, MSH6, CDKN2B, STAT4, RASSF1, RELA, BIRC2, TP53, CASP3, E2F1, CCND2, CAMK2A, NKX3-1, BBC3, E2F2, RASGRP2, BRCA2, IL6ST, RPS6KB1, ABL1, SMAD3, RUNX1, TERT, EGLN2, BCL2, TRAF4, MITF, TRAF1, FOS, NFE2L2, EP300, HGF, JAK2, MYC, CHUK, POLK, GNB5, CRKL, WNT11, ITGAV, EGFR, TGF2, CCDC6, IL7R, SP1, BCL2L11, APC2, FLT4, TCF7L1, RAF1, CCND1, MSH2, FGF17, NOTCH1, IL12A, DLL4, FAS, RARA, FRAT2, FZD8, LRP6, PTGER2, NTRK1, PDGFB, BDKRB2, DAPK2, STAT5A, GADD45G, ARHGEF1, TRAF6, JAG1, WNT2B, PIK3R1, STAT1, FGFR2, TRAF3, NCOA3, ZBTB17, NOS2, TGFB2, KITLG, CDH1, ARNT, CCND3, GSTA1, CBL, TCF7, PIK3CD, FZD5, AXIN1, ITGA6, CDK6, RASGRP1
Transcriptional misregulation in cancer	2.1e-04	0.001	1.647	159	CXCL8, GADD45A, PLA2, GADD45B, NFKB1, PER2, BIRC3, RELA, PAX3, TP53, CEBPB, NFKBIZ, DDX5, CCND2, DUSP6, CCNT1, ETV1, RUNX1, MITF, TRAF1, LDB1, RUNX2, SIX4, MYC, CCNT2, BCL6, POLK, FLT1, SP1, KLF3, IGFBP3, REL, RARA, KMT2A, NTRK1, GADD45G
Cardiac muscle contraction	2.5e-04	0.002	- 1.798	68	ATP1B3, COX7A2, CACNA1F, UQCRL1, COX7B, UQCRCQ, CACNA2D3, COX5A, COX6B1, COX6C, TPM3, COX4I1, UQCRL10, TPM2, MYL4, COX7C, CACNA2D1, COX5B, UQCRLH, UQCRC2, RYR2, COX6A1, CACNG6, ATP1B2, TNNT3, UQCRC1, COX8A, CACNA1S, COX7A2L, FXD2, UQCRB, UQCRLH, UQCRF51, CYC1, COX6B2
Chronic myeloid leukemia	3.1e-04	0.002	1.766	78	NFKBIA, GADD45A, GADD45B, NFKB1, RELA, TP53, E2F1, E2F2, ABL1, SMAD3, RUNX1, MYC, CHUK, POLK, CRKL, SHC3, TGF2, RAF1, CCND1, STAT5A, GADD45G, PIK3R1, TGFB2, PTPN11, CBL, GAB2, PIK3CD, CDK6
Epithelial cell signaling in Helicobacter pylori infection	2.9e-04	0.002	1.834	67	CXCL8, NFKBIA, JUN, CXCL1, NFKB1, RELA, MAP3K14, CASP3, CHUK, EGFR, HBEGF, ATP6V1E2, CXCR2, ATP6V0C, GIT1
Chagas disease (American trypanosomiasis)	3.9e-04	0.003	1.743	92	CXCL8, NFKBIA, JUN, NFKB1, RELA, TICAM1, TNF, SMAD3, FOS, CHUK, CCL2, TGF2, CD3G, IL12A, FAS, BDKRB2, TRAF6, PIK3R1, NOS2, TGFB2
Gastric acid secretion	4.9e-04	0.003	- 1.757	68	CALM2, ATP1B3, KCNQ1, GNAI2, GNAS, CAMK2D, PLCB1, GNAQ, PRKCA, CA2, CALM3, GNAI3, MYLK2, ADCY6, PRKACB, EZR, CFTR, ACTB, ATP1B2, ADCY3, GNAI1, PLCB3, ITPR2, PRKCG, PLCB4, KCNJ10, SLC26A7, CALML6, CAMK2B, GAST
Gap junction	7.6e-04	0.005	- 1.684	80	PRKG1, CDK1, TUBB4B, TUBB, TUBA1C, TUBA1B, MAP2K5, GNAI2, GNAS, PLCB1, GNAQ, PRKCA, HRAS, GRB2, SRC, GNAI3, SOS2, MAP2K2, ADCY6, PRKACB, TUBA1A
Lysosome	8.9e-04	0.005	- 1.586	121	AP3S1, CTSL, ATP6V1H, CTSD, CD63, M6PR, TPP1, GNS, CTSE, AP3B1, HEXB, DNASE2, SORT1, CLTB, LAPTM4A, ARSB, AP3D1, TCIRG1, CTSV, CTSZ, PPT1, LITAF, CLTA, LAMP1, CLTC, GM2A, HYAL1, ARSA, ATP6V0A4,

					ATP6V0D1, SUMF1, CLN3, LAMP2, NAGPA, LAPTM4B, ABCB9, HEXA, GGA1, GUSB, CTSC
Mismatch repair	8.8e-04	0.005	1.865	23	EXO1, POLD3, MSH6, RFC3, RFC5, LIG1, RFC2, MLH3, MSH2
Adrenergic signaling in cardiomyocytes	0.001	0.006	- 1.588	136	CALM2, PPP2R5C, PPP2R5E, ATP1B3, KCNQ1, AKT3, CACNA1F, GNAI2, GNAS, PPP2R5D, CAMK2D, PLCB1, CACNA2D3, GNAQ, PRKCA, ATF2, TPM3, CALM3, AGTR1, GNAI3, PPP2R1A, PPP2R2B, TPM2, PPP1CB, MYL4, ADCY6, MAPK11, PRKACB, CACNA2D1, PPP1CA, RAPGEF4, PPP2CA, PPP1R1A, RYR2, CREB3L4, CACNG6, ATP1B2, TNNI3, CACNA1S, ADCY3, PPP2R2C
Cell cycle	0.001	0.006	- 1.586	124	CCNB1, CDC20, PLK1, BUB1, TTK, CCNA2, CDKN2C, CCNB2, CDK1, PTTG1, YWHAE, CDC25C, YWHAB, YWHAZ, GSK3B, CDC25B, ORC4, BUB3, CUL1, BUB1B, DBF4, TFDP2, ANAPC5, STAG1, MDM2, RAD21, CCNA1, ANAPC11, ANAPC10, HDAC2, SMC1B, RBX1, MAD2L2, HDAC1, YWHAQ, MAD2L1, SKP1, STAG2, SFN, CDC26, ESPL1, CDC16, CDKN1B, CDKN1C, CDC27, SMAD2
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	9.8e-04	0.006	- 1.867	23	EXTL2, HS6ST2, EXT2, HS2ST1, HS6ST1, EXTL3, EXT1, HS3ST1, GLCE, B3GAT3, B4GALT7, NDST3, B3GALT6
MicroRNAs in cancer	9.5e-04	0.006	1.543	165	PLAU, VEGFA, NFKB1, SLC7A1, PIM1, RASSF1, CDC25A, DNMT1, TP53, MCL1, CASP3, E2F1, CCND2, CDCA5, E2F2, ABL1, GLS, THBS1, BCL2, EP300, MYC, CRKL, SIRT1, EGFR, TGFB2, SOX4, BCL2L11, APC2, MIRLET7D, RAF1, SPRY2, IRS1, SOCS1, CCND1, NOTCH1, TNXB
Pancreatic cancer	0.001	0.006	1.684	75	GADD45A, VEGFA, GADD45B, NFKB1, RELA, TP53, E2F1, E2F2, BRCA2, RPS6KB1, SMAD3, CHUK, POLK, EGFR, TGFB2, RAF1, CCND1, GADD45G, PIK3R1, STAT1, TGFB2
Renin secretion	0.001	0.006	- 1.732	56	CALM2, PPP3CB, PPP3CA, CACNA1F, GNAI2, GNAS, PLCB1, GNAQ, CTSB, CALM3, AGTR1, GNAI3, ADORA1, ADCY6, PRKACB, PDE3B, EDNRA, PDE1C, CACNA1S, KCNMA1, GNAI1, PLCB3, ADCYAP1R1, ITPR2, PLCB4
Salmonella infection	0.001	0.006	1.719	77	CXCL8, JUN, CXCL1, CXCL2, NFKB1, CXCL3, RELA, CCL4, IL1A, FOS, KLC2, PKN3
Bacterial invasion of epithelial cells	0.001	0.007	-1.66	67	PTK2, RHOA, CDC42, DOCK1, ARPC2, ELMO1, CTNNA1, PIK3CB, RAC1, ARHGAP10, SRC, CLTB, PXN, MAD2L2, ARPC3, WAS, CLTA, CLTC, CAV2, WASF1, RHOG, ARPC1B, ACTB, CTNNA1, CTNNA3, ARPC1A, CBLC, SHC1, CD2AP, ARPC5
Fanconi anemia pathway	0.001	0.007	1.745	52	PALB2, BRCA2, USP1, TOP3A, ERCC4, POLK, ATR, BRIP1, FANCB, EME2, FANCA, BLM, EME1, FAN1, TOP3B, FANCE, TELO2, POLN, BRCA1, FANCM, ATRIP, RMI2, REV1
Propanoate metabolism	0.001	0.007	- 1.788	31	PCCA, LDHB, LDHC, BCKDHA, SUCLA2, EHHADH, SUCLG1, LDHA, ECHS1, ACACA, HADHA, ALDH6A1, SUCLG2, MCEE, DLD, HIBCH, ACAT1, PCCB
Regulation of actin cytoskeleton	0.001	0.007	- 1.486	203	PTK2, DIAPH3, TIAM1, RHOA, CFL1, CDC42, DOCK1, DIAPH2, FGF13, ARPC2, MYH10, VAV3, PIK3CB, RAC1, PFN2, HRAS, SRC, PIP5K1C, IQGAP2, BRK1, MYL12B, SOS2, ITGB4, MYLK2, MYH14, FGF1, MAP2K2, PPP1CB, CYFIP2, PXN, PPP1CA, EZR, ARPC3, RAC2, MYL9, SCIN, FGF22, WAS, PFN1, LIMK1, FGF18, PIP4K2A, PAK2, WASF1, ARPC1B, ACTB, VAV2, ARAF, ARHGAP35, ITGB5, ABI2, FGF9, ITGAL, FGD3, ARPC1A, ITGAE, SSH3, FGF23, GNG12, FGF20, PDGFC, PDGFA, MSN, ARPC5, PPP1CC, RRAS2, PPP1R12B, PAK5, ACTN1, FGF21, RRAS
Ubiquitin mediated proteolysis	0.001	0.007	- 1.567	133	CDC20, UBE2C, UBE2S, UBE2L3, MID1, UBE2N, UBE2E3, UBE2D2, CUL1, UBE2E2, UBE2L6, PIAS1, ANAPC5, MDM2, UBE2B, UBE2F, ANAPC11, ANAPC10, KLHL13, STUB1, UBE2E1, UBE2K, CDC34, PPII2, ELOB, RBX1, FBXO2, UBE2G1, UBE2H, SKP1, PRKN, UBE2D4, CDC26,

					DDB2, BTRC, CDC16, CDC27, TRIP12, UBE2G2, VHL, CUL4B, UBA6, UBE2Q2, UBOX5, UBE4B
Pancreatic secretion	0.002	0.008	-1.631	83	ATP1B3, RHOA, KCNQ1, RAB11A, RAB8A, GNAS, PLCB1, RAC1, GNAQ, PRKCA, ATP2A1, RAB3D, CA2, ADCY6, SLC4A4, RAP1A, CFTR, RYR2, CELA2B, CEL, ATP1B2, ADCY3, KCNMA1, FXD2, PLA2G12A
Cellular senescence	0.002	0.009	1.554	152	CXCL8, GADD45A, GADD45B, NFKB1, ZFP36L1, ETS1, CDKN2B, SQSTM1, RELA, NFATC1, CDC25A, TP53, HLA-E, E2F1, CCND2, E2F2, IL1A, SMAD3, RAD9A, CHEK1, TRAF3IP2, NFATC2, ZFP36L2, MYC, SIRT1, LIN54, TSC2, TGF2, ATR, RAF1, CCND1, HIPK1, NFATC3, IGFBP3
Colorectal cancer	0.002	0.009	1.688	71	JUN, GADD45A, GADD45B, PMAIP1, MSH6, TP53, CASP3, BBC3, SMAD3, BCL2, FOS, MYC, POLK, TGF2, BCL2L11, APC2, TCF7L1, RAF1, CCND1, MSH2, GADD45G, PIK3R1, TGF2, TCF7, PIK3CD, AXIN1
Hepatitis C	0.002	0.01	1.595	113	CXCL8, NFKBIA, NFKB1, CLDN1, RELA, TICAM1, TP53, TNF, IRF1, IRF7, OAS3, CHUK, EGFR, EIF2AK2, RAF1, TRAF6, PIK3R1, OAS2, STAT1, PSME3, TRAF3

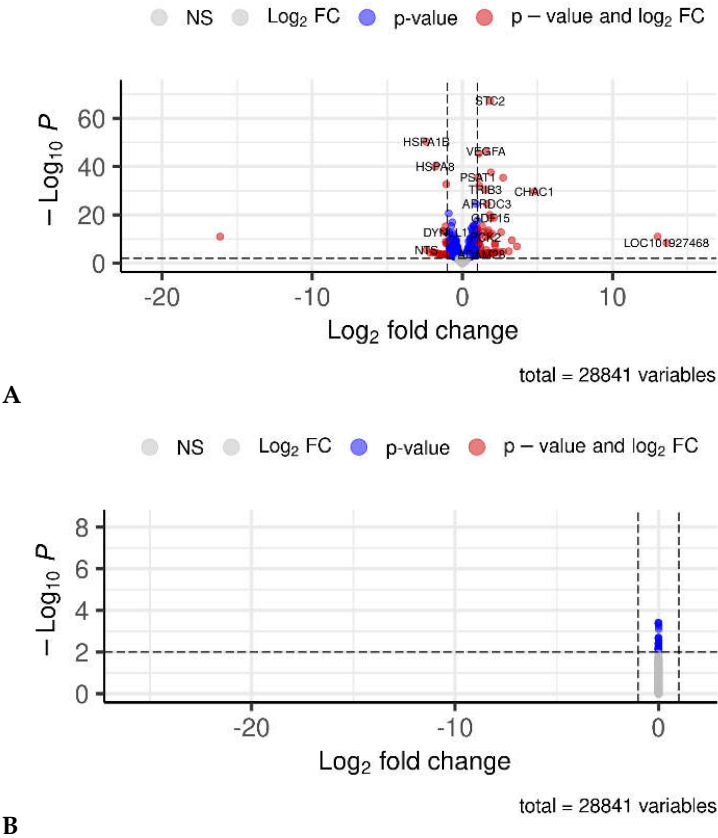


Figure S4. OL9-119 effect on A) WT HEK293A cells treated with 5 μ M OL9-119 vs untreated cells; B) PARP1-KO HEK293A cells treated with 5 μ M OL9-119 vs cells treated with 0.1% DMSO. Volcano Plots for differential gene expression under the influence of OL9-119.

Table S3. Gene set enrichment analysis results of OL9-119 effect on gene expression: pathways significantly associated with differentially expressed genes upon treatment with OL9-119 or DMSO (WT HEK293A cells treated with 5 μ M OL9-119 vs cells treated with 0.1% DMSO).

Pathway	<i>p</i> -Value	<i>p</i> -adj	NES	Number	Genes
Ribosome	2.4e-33	7.4e-31	- 3.092	129	RPS27L, MRPL33, MRPL23, RPL35, RPL7A, RPL24, RPL36AL, MRPL13, RPL35A, RPL22, UBA52, RPS26, RPL38, RPS4X, RPL29, RPL6, MRPL18, RPL19, RPS25, RPLP0, RPS3A, RPL26L1, RPS7, RPL34, MRPL36, MRPL20, RPL23A, FAU, MRPL11, RPS27A, RPL23, RPL5, RPS24, RPS12, RPL41, RPL27, RPL11, MRPL21, RPS13, RPS6, MRPL14, RPS14, RPL36, RPS8, MRPS9, RPL7, MRPS11, RPS16, MRPL35, RPL21, RPL27A, RPS5, RPL14, RPL9, MRPL27, RPL37A, MRPS7, RPS18, RPLP1, MRPL28, MRPS21, RPL10, RPL10A, RPL4, RPSA, MRPL1, RPS27, MRPS14, RPL18, RPL12, RPS20, MRPS18C, MRPL30, MRPS6, RPL37, MRPL24, RPS23, RPS19, RPLP2, RPL13, MRPS15, RPS2, RPL31, MRPL34, RPL15, RPL3, RPL8, RPL39, RPS11, MRPL3, MRPL9, MRPS12, RPL13A, RPL28, RPS15, RPS3, MRPL15, RPL36A, RPS9, MRPS16, MRPL12
Oxidative phosphorylation	5.0e-21	7.9e-19	- 2.852	98	NDUFB4, COX7A2, COX7B, NDUFB3, NDUFA4, ATP6V0E1, NDUFS5, NDUFA2, UQCRQ, ATP6V1E1, NDUFA12, COX7A2L, NDUFAB1, NDUFB9, ATP6V0E2, NDUFA5, UQCR10, UQCR11, COX17, NDUFA3, NDUFA8, COX6C, NDUFS6, NDUFA6, SDHD, COX5A, COX6B1, NDUFB2, NDUFB6, UQCRH, NDUFC1, COX7C, ATP6V0A4, NDUFB10, NDUFS4, NDUFB5, COX4I1, COX8A, SDHC, PPA1, UQCRB, NDUFA1, UQCRC2, NDUFA9, PPA2, COX5B, NDUFS3, ATP6V0D1, NDUFB1, ATP6V1G1, UQCRFS1, UQCRC1, NDUFC2, NDUFB11, ATP6V1H, NDUFS8, SDHA, ATP6V0B, NDUFS7, ATP6V0A1
Parkinson's disease	2.5e-20	2.7e-18	- 2.794	109	NDUFB4, COX7A2, UBE2L3, COX7B, NDUFB3, NDUFA4, NDUFS5, NDUFA2, PARK7, UQCRQ, VDAC3, NDUFA12, COX7A2L, UBB, VDAC1, GNAI2, NDUFAB1, NDUFB9, CYCS, SNCA, NDUFA5, UQCR10, UQCR11, NDUFA3, NDUFA8, COX6C, NDUFS6, NDUFA6, SDHD, COX5A, UBE2G2, UCHL1, COX6B1, NDUFB2, NDUFB6, UQCRH, NDUFC1, COX7C, NDUFB10, NDUFS4, NDUFB5, COX4I1, SLC25A5, COX8A, SDHC, UQCRB, NDUFA1, SLC25A4, UQCRC2, NDUFA9, COX5B, NDUFS3, GNAI3, NDUFB1, GNAI1, UQCRFS1, UQCRC1, NDUFC2, APAF1, NDUFB11, NDUFS8, SDHA, VDAC2, NDUFS7
Alzheimer's disease	3.9e-18	3.0e-16	- 2.586	144	NDUFB4, COX7A2, CALM2, COX7B, NDUFB3, NDUFA4, CALM1, NDUFS5, NDUFA2, UQCRQ, CALM3, NDUFA12, COX7A2L, NDUFAB1, NDUFB9, CYCS, SNCA, HSD17B10, NDUFA5, UQCR10, UQCR11, NDUFA3, CACNA1F, NDUFA8, COX6C, NDUFS6, NDUFA6, SDHD, COX5A, COX6B1, RTN3, NDUFB2, NDUFB6, UQCRH, CDK5, NDUFC1,

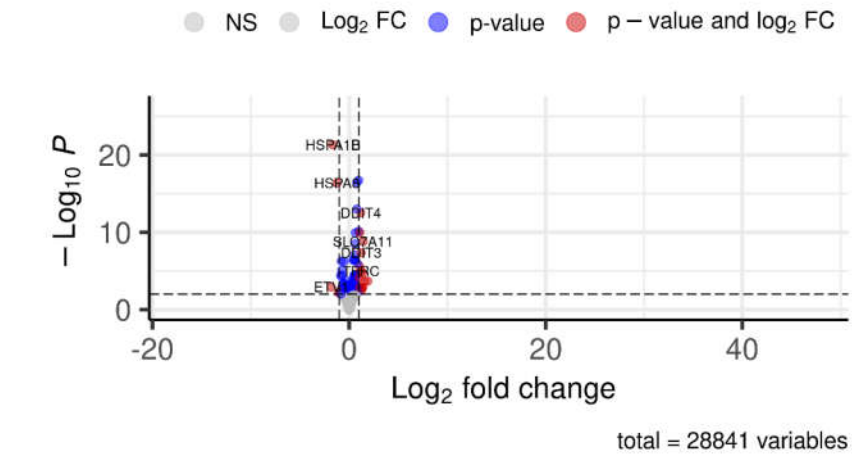
					COX7C, GAPDH, NDUFB10, NDUFS4, NDUFB5, COX4I1, COX8A, SDHC, UQCRB, NDUFA1, PPP3CB, UQCRC2, NDUFA9, COX5B, CASP7, NDUFS3, NDUFB1, PSENEN, UQCRFS1, UQCRC1, NDUFC2, APAF1, ATP2A1, NDUFB11, APBB1, NDUFS8, PPP3CC, MME, SDHA, MAPK3
Spliceosome	2.0e-17	1.3e-15	-2.637	131	HSPA1B, HSPA8, LSM3, HNRNPM, SRSF3, DDX23, SF3B5, PPIH, SNRPE, SNRPG, PHF5A, SNRPD2, SNRPD3, RBMX, SNRPF, SRSF9, CWC15, SNRPC, SF3B6, HNRNPA1, SRSF2, DDX5, SNRPB2, LSM5, SRSF1, TXNL4A, SNRPD1, NCBP2, SF3B4, PRPF18, LSM7, EFTUD2, PPIL1, PRPF31, SNRPA1, CHERP, RBM25, LSM8, SNU13, SNRNP70, ALYREF, HNRNPC, RBM8A, HNRNPA3, LSM4, SNRNP27, HSPA1A, SRSF8, PRPF38B, ACIN1, BCAS2, ISY1, CTNNBL1, SNRPB, EIF4A3, LSM2, ZMAT2, PCBP1, HNRNPK, SF3B3, DDX46, RBM22
Huntington's disease	9.9e-14	5.1e-12	-2.35	169	NDUFB4, COX7A2, COX7B, NDUFB3, NDUFA4, POLR2K, NDUFS5, POLR2L, NDUFA2, UQCRQ, VDAC3, NDUFA12, COX7A2L, VDAC1, NDUFAB1, NDUFB9, CYCS, SOD1, NDUFA5, UQCR10, POLR2E, SOD2, UQCR11, NDUFA3, NDUFA8, COX6C, NDUFS6, NDUFA6, SDHD, COX5A, POLR2F, COX6B1, HDAC1, NDUFB2, NDUFB6, UQCRH, AP2M1, NDUFC1, COX7C, NDUFB10, NDUFS4, NDUFB5, POLR2G, COX4I1, SLC25A5, COX8A, SDHC, UQCRB, NDUFA1, CLTA, BAX, SLC25A4, UQCRC2, POLR2C, DCTN2, NDUFA9, POLR2J, TGM2, HDAC2, COX5B, CLTB, NDUFS3, NDUFB1, DNAH5, POLR2I, UQCRFS1, POLR2D, UQCRC1, NDUFC2, APAF1
Proteasome	1.5e-12	6.9e-11	-2.619	43	POMP, PSMA3, PSMB2, PSMA5, PSMA4, PSMB5, PSME2, PSMD6, PSMB1, PSME3, PSMC3, PSMA7, PSMD1, PSMD12, PSMC2, SEM1, PSMB7, PSMF1, PSME1, PSMD4, PSMD7, PSMB3, PSMC5, PSMD8, PSMC4, PSMB4, PSMB6, PSMD14, PSMC6, ADRM1, PSMB10, PSMC1, PSMD3, PSMB9, PSMD11
Protein processing in endoplasmic reticulum	4.7e-10	1.9e-08	-2.154	157	HSPA1B, HSPA8, DNAJB1, DNAJA1, HSPH1, HSP90AB1, VCP, SSR2, SEC61G, DNAJA2, DAD1, HSP90AA1, SSR3, RBX1, UFD1, UBE2D2, SSR1, BCAP31, SEC61B, SEC61A1, SAR1A, PDIA3, RPN2, UBE2G2, SKP1, RPN1, YOD1, DERL2, SSR4, SAR1B, CALR, BAG2, UBE2D3, HSP90B1, EIF2S1, BAX, OS9, HSPA1A, SEC62, PDIA6, SEC13, PLAA, PREB, HSPBP1, P4HB, TRAM1, UBE4B, STUB1, STT3A, DNAJB11, FBXO2, BAG1, SEC24A, DNAJB2, ERO1A, GANAB, STT3B, TUSC3, HSPA4L, PRKCSH, UBQLN1, LMAN2
Non-alcoholic fatty liver disease (NAFLD)	1.9e-09	6.6e-08	-2.15	135	NDUFB4, COX7A2, COX7B, NDUFB3, NDUFA4, CDC42, NDUFS5, NDUFA2, UQCRQ, NDUFA12, COX7A2L, NDUFAB1, NDUFB9, CYCS, NDUFA5, UQCR10, UQCR11, NDUFA3, NDUFA8, COX6C, NDUFS6, NDUFA6, SDHD, COX5A, RAC1, COX6B1,

					NDUFB2, NDUFB6, UQCRH, NDUFC1, COX7C, NDUFB10, NDUF54, NDUFB5, COX4I1, COX8A, SDHC, UQCRB, NDUF1A, EIF2S1, BAX, UQCRC2, NDUF1A9, ADIPOR1, COX5B, CASP7, GSK3A, NDUF53, NDUFB1, UQCRFS1, UQCRC1, NDUFC2, IL6, MAP3K11, NDUFB11, CYP2E1, NDUF58, SDHA, MLXIP
Oocyte meiosis	3.1e-08	9.6e-07	-2.15	109	CALM2, PTTG1, YWHAB, CALM1, CCNB1, YWHAZ, CALM3, RBX1, AURKA, CDK1, YWHAQ, SKP1, BUB1, CCNE2, PPP2CB, YWHAH, PPP1CA, CCNB2, MAD2L1, PPP2CA, CDC20, PPP2R1B, PPP2R5D, CDK2, SMC1B, PPP3CB, CDC26, SPDYA, MAD2L2, ANAPC13, YWHAG, ANAPC11, PPP2R5B, PPP2R1A, PPP2R5C, PPP3CC, ANAPC10, MAPK3
TNF signaling pathway	2.9e-07	8.2e-06	2.066	106	CEBPB, NFKBIA, JUN, TNFAIP3, JUNB, CXCL3, CREB1, JAG1, CXCL2, SELE, ATF4, CREB5, ICAM1, PIK3CA, MMP9, TAB2, PTGS2, TRAF3, MAPK9, VEGFC, TRAF1, ITCH, NFKB1, CXCL10, BIRC2, BIRC3, MAP3K7, PIK3R1, SOCS3, MAP3K8, TAB1, MAP2K7, MAPK10, IKBKB, LTA, PIK3CD, TAB3, TRAF5, CHUK, DNMT1L, IL18R1, MAPK8
Retrograde endocannabinoid signaling	3.5e-07	9.1e-06	-1.987	129	NDUFB4, NDUFB3, NDUF1A4, NDUF55, NDUF1A2, NDUF1A12, GNAI2, NDUF1AB1, NDUFB9, NDUF1A5, NDUF1A3, CACNA1F, GRIA4, NDUF1A8, NDUF56, NDUF1A6, NDUFB2, NDUFB6, NDUFC1, MGLL, NDUFB10, NDUF54, NDUFB5, GNG5, NDUF1A1, NDUF1A9, NDUF53, GNAI3, GNG11, MAPK11, NDUFB1, GNAI1, GNGT1, NDUFC2, NDUFB11, PRKCG, NDUF58, MAPK3, GNG4, NDUF57, KCNJ3, GNB3, GNG7
Cardiac muscle contraction	4.3e-07	1.0e-05	-2.178	68	TPM3, COX7A2, COX7B, ATP1B3, UQCRQ, COX7A2L, UQCR10, UQCR11, CACNA1F, COX6C, COX5A, COX6B1, UQCRH, COX7C, COX4I1, COX8A, ATP1B1, UQCRB, TPM4, UQCRC2, TNNT3, COX5B, TPM1, UQCRFS1, UQCRC1
Phagosome	5.3e-07	1.2e-05	-1.953	135	VAMP3, TUBB, ACTB, ATP6V0E1, SEC61G, TUBB4B, ATP6V1E1, ACTG1, RAB7A, TUBA1C, ATP6V0E2, TUBA1A, SEC61B, SEC61A1, HLA-DRB1, RAB5C, RAC1, TUBA1B, TUBB6, COLEC12, HLA-A, M6PR, HLA-DQB1, ATP6V0A4, C1R, CALR, HLA-DMB, CTSL, PIK3C3, RAB5B, LAMP1, ATP6V0D1, ATP6V1G1, DYNC1I2, CTSS, DYNC1LI2, TUBB8, ATP6V1H, ATP6V0B, HLA-DPA1, ATP6V0A1, ATP6V1A, ATP6V0C, ITGB2, HLA-DQA2, HLA-DQA1, ITGA5, STX12, LAMP2, RILP, SEC22B, DYNC1LI1, ATP6V1B2, HLA-E, NCF2, HLA-DPB1, TUBA8, ATP6V1C1, TUBB4A, CLEC4M, HLA-B, PLA2R1, SCARB1
Antigen processing and presentation	5.9e-06	1.1e-04	-2.102	60	HSPA1B, HSPA8, HSP90AB1, HSP90AA1, HSPA4, PSME2, B2M, HLA-DRB1, PDIA3, PSME3, KLRC2, HLA-A, RFXANK, PSME1, HLA-DQB1, CALR, HLA-DMB, CTSL, HSPA1A, NFYA, CTSS, TAPBP, IFI30

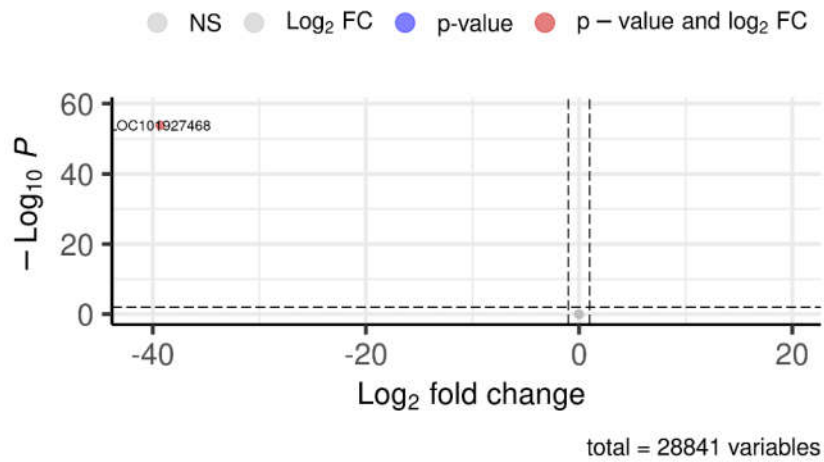
Protein export	5.7e-06	1.1e-04	- 2.163	23	SRP9, SEC61G, SEC61B, SEC61A1, SPCS1, SRP14, SRPRB, SPCS2, SEC11C, SPCS3, SEC11A, SEC62, IMMP2L
Osteoclast differentiation	1.7e-05	2.9e-04	1.858	117	NFKBIA, JUN, GAB2, RELB, JUNB, MITF, CREB1, TEC, FOSL2, IL1A, PIK3CA, TAB2, MAPK9, JUND, NFATC1, FYN, BTK, SQSTM1, NFKB1, FHL2, FOSB, OSCAR, MAP3K7, PIK3R1, LCK, SOCS3, STAT1, TAB1, MAP2K7, MAPK10, CYLD, IKBKB, PIK3CD, CHUK, CSF1R, FCGR2B, MAPK8
Signaling pathways regulating pluripotency of stem cells	1.8e-05	2.9e-04	1.826	132	ID4, INHBE, KLF4, ID3, SETDB1, FZD8, AXIN1, PCGF6, PIK3CA, MYC, KAT6A, JAK2, RAF1, IL6ST, STAT3, RIF1, ACVR1, PCGF3, SMAD9, ID1, ZFH3, SMAD5, DVL1, WNT4, PIK3R1, DLX5, WNT9A, SMAD3, ACVR2A, LEFTY2, PIK3CD, SMAD1, LIFR, KRAS, FZD1, SKIL, PCGF5, LHX5, DVL2, HESX1, PCGF1, ONECUT1, HAND1, FGF2, WNT3, OTX1, FZD7, WNT5B, POU5F1, APC, BMPR2, PAX6, INHBA, FZD4, MAPK14, ZIC3, INHBC, SMAD2, BMPR1A, FGFR2, WNT6
Vibrio cholerae infection	1.6e-05	2.9e-04	- 2.048	48	ACTB, ATP6V0E1, SEC61G, ATP6V1E1, ACTG1, ATP6V0E2, SEC61B, SEC61A1, KDELR1, ATP6V0A4, GNAS, CFTR, ARF1, ATP6V0D1, ATP6V1G1, KDELR2, ATP6V1H, ATP6V0B, ERO1A, ATP6V0A1, ATP6V1A, ATP6V0C, PLCG2, PRKACB, PRKACA
Lysosome	3.0e-05	4.6e-04	- 1.799	121	LITAF, GLA, AP3S1, M6PR, CD63, AP1S3, LAPTM4B, ATP6V0A4, CTSV, PPT1, AP1S2, TPP1, CTSD, AP4B1, PPT2, CTSC, CLTA, HEXB, GGA1, CTSL, GM2A, CTSH, CD164, CLN5, LAMP1, CTSB, CLTB, AP1S1, ATP6V0D1, HYAL1, FUCA1, CTSZ, AP1M2, CTSS, PLA2G15, ATP6V1H, ATP6V0B, ACP2, ASAH1, ATP6V0A1, GUSB, CTSB, LIPA, ATP6V0C, LGMN, AP3D1, AP1M1, AP4S1, LAMP2, ARSB, CTSK, DNASE2, SUMF1, AP4E1
NF-kappa B signaling pathway	3.1e-05	4.6e-04	1.94	86	GADD45B, NFKBIA, TNFAIP3, RELB, BCL2, CXCL2, CD14, ICAM1, CARD11, PLCG1, TICAM1, TIRAP, TAB2, PTGS2, TRAF3, TRAF1, BTK, NFKB1, PLA2, BIRC2, BIRC3, MAP3K7, LCK, ATM, CSNK2A1, TAB1, TICAM2, PIAS4, IKBKB, LTA, TAB3, TRAF5, CHUK, IRAK4, TNFSF14, LBP, CARD10
RNA transport	3.9e-05	5.6e-04	- 1.734	162	RAN, EIF4E2, EIF4EBP2, SUMO2, POP4, CLNS1A, GEMIN7, UBE2I, THOC7, SUMO1, EIF1AX, TACC3, POP5, NCBP2, EIF5B, EIF3H, STRAP, SAP18, EIF2B5, SMN2, PYM1, SMN1, EIF3B, ALYREF, RAE1, RBM8A, EIF2S1, EIF3G, PHAX, GEMIN6, ACIN1, SNORD3B-2, EEF1A1, RPP30, POP1, SEC13, EIF4A3, EIF3F, NUP35, EIF4E, SUMO3, EIF3E, NCBP1, TGS1, EIF3I, RANGAP1, FXR2, EIF4G1, EIF2B1, THOC2, NUP107, EIF3J, EIF4G2, NXT2, UPF2, NXF1, NUP37, NUP88, PABPC1, RNPS1, POP7
Epstein-Barr virus infection	5.2e-05	7.0e-04	- 1.676	193	HSPA1B, HSPA8, YWHAB, POLR2K, RAN, POLR2L, YWHAZ, CDK1, PSMD6, POLR2E, YWHAH, HLA-DRB1, YWHAQ, PTMA, POLR2F, PSMC3, CDKN1A, PSMD1, HLA-A, MAP2K3, PSMD12, HSPB1, PSMC2,

					CCNA2, HDAC1, SEM1, HLA-DQB1, PSMD4, POLR3GL, YWHAH, PSMD7, POLR2G, POLR1D, PSMC5, CDK2, POLR3H, HSPA1A, POLR2C, POLR2J, HDAC2, PSMD8, PSMC4, YWHAG, PSMD14, MAPK11, POLR2I, GTF2E2, POLR2D, MDM2, PSMC6, POLR3K, GTF2E1, ADRM1, HLA-DPA1, PSMC1, CD38, TBPL1, PSMD3, TBK1, CCNA1, PSMD11, TRAF2, PLCG2, GSK3B, MAP2K4, POLR2H, PRKACB, ITGAL, IRAK1, ENTPD8, HLA-DQA2, HLA-DQA1
Glutathione metabolism	1.1e-04	0.001	-1.945	44	GSTP1, PGD, SMS, GSTO1, GSTM3, TXNDC12, MGST2, IDH1, GSTA3, GPX3, RRM2, GPX4, LAP3, RRM1, SRM, GSTT2B, MGST1, ODC1, GSTA4, MGST3, GSTO2, GPX1, GGT6
Metabolism of xenobiotics by cytochrome P450	2.0e-04	0.003	-1.86	40	GSTP1, GSTO1, ADH5, GSTM3, MGST2, CBR3, EPHX1, GSTA3, CYP1B1, CYP2E1, DHDH, CBR1, GSTT2B, MGST1, GSTA4, AKR1C1, MGST3, GSTO2, ALDH3B2
Purine metabolism	2.4e-04	0.003	-1.624	164	POLR2K, POLR2L, CANT1, HPRT1, POLR2E, NME4, POLR2F, NT5C3B, PKM, NME1, PNPT1, APRT, POLR3GL, NUDT9, POLR2G, PAICS, POLD2, POLE4, PRPS1, POLR1D, PNP, NTPCR, POLR3H, HDDC3, AK2, PGM1, POLR2C, POLR2J, ENTPD2, PDE4B, ATIC, PDE1B, POLR2I, ENTPD6, PDE8B, PRIM2, DCK, POLR2D, RRM2, NUDT2, POLR3K, GUCY2C, RRM1, ALLC, POLA2, IMPDH1, AK1, GUK1, PDE6D, PGM2, AK7, ZNRD1, PDE3B, POLR2H, ENTPD8, PDE6G
Systemic lupus erythematosus	2.9e-04	0.003	-1.846	40	SNRPD3, HLA-DRB1, SNRPD1, HLA-DQB1, C1R, SSB, HLA-DMB, SNRPB, TRIM21, HLA-DPA1, C2, ACTN4, ACTN1, HLA-DQA2, HLA-DQA1
Breast cancer	3.6e-04	0.004	1.629	146	GADD45B, JUN, HEY1, GADD45A, JAG1, CSNK1A1, RPS6KB1, EGFR, HEY2, FZD8, AXIN1, PIK3CA, MYC, ERBB2, LRP6, HES5, SHC2, HES1, POLK, RAF1, DLL1, BRCA2, HEYL, GADD45G, NCOA3, NCOA1, BRCA1, DVL1, WNT4, FLT4, PIK3R1, ESR2, WNT9A, TP53, FGF4, NOTCH1, FGF11, KIT, FGF19, SHC3, PIK3CD, DLL4, MTOR, KRAS, FZD1, DVL2, E2F1, FGF2, WNT3, SOS1, FZD7, WNT5B
Cell cycle	4.8e-04	0.005	-1.63	124	PTTG1, YWHAB, CCNB1, PCNA, YWHAZ, RBX1, TTK, CDK1, YWHAH, YWHAQ, CCND1, CCND3, SKP1, SFN, BUB1, CDKN1A, CCNA2, HDAC1, CCNE2, CDKN2C, YWHAH, CCNB2, MAD2L1, CDC20, CDK2, SMC1B, CDC26, MAD2L2, HDAC2, ANAPC13, YWHAG, ANAPC11, CDK7, CDC25A, MDM2, MCM6, TFDP1
Transcriptional misregulation in cancer	5.0e-04	0.005	1.586	159	DDIT3, CEBPB, GADD45B, NUPR1, PER2, MITF, CCND2, BCL6, GADD45A, PAX3, CD14, NSD2, CEBPA, CDK9, MYC, LDB1, MMP9, NCOR1, FLT1, POLK, TRAF1, JMJD1C, ETV7, CCNT2, ZEB1, GADD45G, NFKB1, PLAU, SIN3A, KDM6A, BIRC3,

					FOXO1, NTRK1, KLF3, ZBTB17, ATM, TP53, CDK14, ETV1, BAIAP3, RUNX2
Insulin resistance	6.9e-04	0.006	1.714	102	TRIB3, PCK2, NFKBIA, CREB1, GFPT1, RPS6KB1, CREB5, PIK3CA, MAPK9, IRS2, PPARGC1B, PRKAG2, OGT, PRKCZ, STAT3, NFKB1, FOXO1, PIK3R1, SOCS3, PTPRF, PPP1R3B, PDPK1, PRKAA1, MAPK10, SREBF1, IKBKB, PPP1R3C, PIK3CD, PTPN11, MTOR, PTPN1, RPS6KA3, MAPK8
N-Glycan biosyntheses	6.9e-04	0.006	- 1.846	47	DAD1, DPM1, RPN2, MGAT4C, RPN1, DPM3, DPAGT1, ALG6, MGAT1, DPM2, STT3A, DOLK, ALG8, GANAB, STT3B, TUSC3, ALG1, MGAT5B, FUT8, ALG14, B4GALT2, DDOST, MGAT2, MGAT3, DOLPP1, ALG10B, B4GALT3, ALG3, ALG11
Pyrimidine metabolism	6.1e-04	0.006	- 1.704	98	POLR2K, POLR2L, CANT1, POLR2E, DCTPP1, DUT, NME4, POLR2F, NT5C3B, NME1, PNPT1, POLR3GL, POLR2G, POLD2, POLE4, POLR1D, PNP, POLR3H, POLR2C, POLR2J, DTYMK, POLR2I, TYMS, ENTPD6, PRIM2, DCK, POLR2D, RRM2, NUDT2, POLR3K, CTPS2, RRM1, POLA2, UCKL1, DCTD, ZNRD1, POLR2H, DPYS, ENTPD8, DPYD
RNA degradation	5.5e-04	0.006	- 1.749	74	LSM3, BTG2, DCP2, WDR61, HSPD1, LSM5, TOB2, ENO1, PNPT1, LSM7, EDC3, LSM8, EXOSC4, LSM4, DDX6, DIS3, LSM2, EXOSC5, EXOSC9, MPHOSPH6, EXOSC10, TOB1, BTG3, PNLDC1, LSM6, ENO3, CNOT2, LSM1, CNOT7, EXOSC1, C1D, PABPC1, PABPC4, BTG4, EXOSC3, PAN3, EXOSC7, CNOT4, DCPS
Pathogenic Escherichia coli infection	8.3e-04	0.007	- 1.766	51	TUBB, ACTB, CDC42, ARPC5, RHOA, YWHAZ, TUBB4B, ACTG1, TUBA1C, TUBA1A, ARPC2, YWHAQ, CTNNB1, TUBA1B, TUBB6, ARPC3, KRT18, EZR
Chemical carcinogenesis	9.7e-04	0.008	- 1.794	45	GSTP1, SULT1A1, GSTO1, ADH5, NAT2, GSTM3, MGST2, EPHX1, GSTA3, AKR1C2, CYP1B1, CYP2E1, CBR1, GSTT2B, MGST1, GSTA4, SULT1A3, MGST3, GSTO2, ALDH3B2, NAT1
Drug metabolism - cytochrome P450	9.9e-04	0.008	- 1.814	35	GSTP1, GSTO1, ADH5, GSTM3, MGST2, AOX1, GSTA3, MAOB, CYP2E1, GSTT2B, MGST1, GSTA4, MGST3, GSTO2, ALDH3B2
Pyruvate metabolism	8.7e-04	0.008	-1.85	38	MDH1, LDHA, LDHB, FH, MDH2, GLO1, PKM, ME3, ALDH7A1, LDHC, ACAT1, ACAT2, ME1, ALDH3A2, ACYP2, ALDH1B1, ACYP1, DLAT, ACSS2, PDHA1, PDHB
Terpenoid backbone biosyntheses	9.5e-04	0.008	- 1.891	22	IDI1, ICMT, NUS1, PMVK, FDPS, FNTA, FNTB, ACAT1, ACAT2, PDSS1, MVD
Progesterone-mediated oocyte maturation	0.001	0.009	- 1.647	88	HSP90AB1, CCNB1, HSP90AA1, AURKA, GNAI2, CDK1, BUB1, CCNA2, CCNB2, MAD2L1, CDK2, CDC26, SPDYA, MAD2L2, ANAPC13, GNAI3, ANAPC11, MAPK11, CDC25A, GNAI1, ANAPC10, MAPK3, ANAPC5, CCNA1, CDC25B, PDE3B, PRKACB, PRKACA, CDC25C, KIF22



A



B

Figure S5. Effect of topotecan and OL9-119 combination on A) WT HEK293A cells treated with Tpc + OL9-119 vs cells treated with Tpc + 0.1% DMSO; B) PARP1-KO HEK293A cells treated with Tpc + OL9-119 vs cells treated with Tpc + 0.1% DMSO. Volcano Plot for differential gene expression under the influence of topotecan and OL9-119.

Table S4. Gene set enrichment analysis results of the combination of topotecan and OL9-119 effect on gene expression: pathways significantly associated with differentially expressed genes upon treatment with topotecan and DMSO or topotecan and OL9-119 (WT HEK293A cells treated with 100 nM Tpc + 5 μ M OL9-119 vs cells treated with Tpc + 0.1% DMSO).

Pathway	<i>p</i> -Value	<i>p</i> -adj	NES	Number	Genes
Ribosome	5.3e-10	1.6e-07	-2.23	129	MRPL36, RPS15, RPL36AL, MRPS21, MRPL23, RPL24, MRPS17, RPS27L, RPL35, RPS7, RPL38, RPL18A, RPL34, MRPL16, RPS16, RPL27, RPS26, RPL36, RPS5, RPL28, MRPL27, RPL23, RPL8, RPL18, MRPL33, RPS28, MRPS18C, MRPL20, RPL7A, MRPL28, MRPS7, MRPL24, RPS3, MRPS12, UBA52, RPL41, RPL37A, RPL26, RPL10, RPL35A, RPS17, RPS13, MRPL35, RPL30, RPL7, RPS11, RPS14, RPSA, RPL29, MRPL34, RPL37, RPL21, RPL10A, RPL14, MRPL18, MRPL17, FAU, RPL26L1, MRPL1, RPL11, RPS20, RPS25, RPL17, RPS19, RPS23, MRPL2, MRPL3, RPS29, MRPL21, RPL23A, RPS8, RPL15, RPS2, RPL32, RPS4X, RPS9, RPL39, RPS21, RPS12, RPS10, RPL6, RPL13, RPS27, RPL22, MRPL19, RPL27A, MRPS15
Oxidative phosphorylation	8.0e-08	1.2e-05	-2.109	98	NDUFA2, NDUFA4, NDUF55, COX17, NDUFA8, NDUF53, NDUFA1, NDUF56, NDUFB7, COX7B, COX8A, COX6B1, ATP6V1B2, ATP6V0E2, SDHD, UQCRH, ATP6AP1, ATP6V0E1, ATP6V0B, NDUF52, ATP6V1F, NDUF53, COX4I1, COX7C, UQCR10, COX7A2, NDUFA11, ATP6V0A4, ATP6V0C, NDUF57, NDUF58, COX7A2L, NDUF59, NDUFA3, CYC1, UQCRQ, NDUF56, NDUF51, NDUFA6, COX5B, NDUF54, NDUF52, ATP6V0D1, NDUF54, UQCRC1, COX6A1
Huntington's disease	3.0e-07	3.1e-05	-1.892	169	POLR2L, NDUFA2, NDUFA4, NDUF55, POLR2E, NDUFA8, NDUF53, NDUFA1, NDUF56, POLR2F, NDUF57, POLR2G, COX7B, COX8A, HDAC1, AP2S1, COX6B1, POLR2C, SDHD, UQCRH, CREB3L2, TBPL1, PPIF, VDAC1, SOD2, NDUF52, NDUF53, AP2M1, COX4I1, POLR2B, COX7C, UQCR10, COX7A2, NDUFA11, VDAC3, POLR2K, GPX1, SLC25A5, NDUF57, NDUF58, COX7A2L, GRIN2B, NDUF59, NDUFA3, CYC1, DNAH2, UQCRQ, NDUF56, DNAH5, NDUF51, CYCS, DNAI2, POLR2H, NDUFA6, AP2A2, COX5B, SLC25A6, EP300, NDUF54, NDUF52, DNAH3, CLTA, NDUF54, UQCRC1, COX6A1, POLR2J3, DNAH8
Spliceosome	7.8e-07	6.1e-05	-1.927	131	HSPA1B, HSPA8, SF3B5, HSPA1A, HNRNPM, PPIH, DDX23, CHERP, SNRPG, SRSF3, PRPF3, SNRPD2, SF3B4, ALYREF, LSM7, LSM3, SRSF2, DDX5, LSM2, HNRNPA1, SRSF1, DHX16, U2AF2, RBM8A, SNRPD3, NCBP2, SNRPB, PRPF38B, SF3B3, U2AF1L4, LSM4, HNRNPK, PUF60, ACIN1, ISY1, SNRNP70
Parkinson's disease	1.2e-06	7.7e-05	-2.012	109	NDUFA2, NDUFA4, NDUF55, NDUFA8, NDUF53, NDUFA1, NDUF56, NDUF57, COX7B, COX8A, COX6B1, UBE2L3, SDHD, UQCRH, PPIF, UBA1, VDAC1, UBB, ADORA2A, NDUF52, NDUF53, COX4I1, COX7C, UQCR10, COX7A2, NDUFA11, VDAC3, PARK7, SLC25A5, NDUF57, NDUF58, COX7A2L, NDUF59, NDUFA3, CYC1,

					GNAI2, UQCRCQ, NDUFB6, NDUFC1, CYCS, LRRK2, NDUFA6, COX5B, SLC25A6, SNCAIP, NDUFB4, NDUFB2, NDUF54, UQCRC1, COX6A1
Proteasome	3.9e-06	2.0e-04	-2.164	43	PSME3, PSMA3, PSMD3, PSMB2, PSMB4, POMP, SEM1, PSMD6, PSMB5, PSMB7, PSMC4, PSMC5, PSMD2, PSMC6, PSMC2, PSMB6, PSMB3, PSMD1, PSMD8, PSMF1, PSMC3, PSMA7, PSMB1, PSMA1
Regulation of actin cytoskeleton	5.7e-05	0.003	-1.641	203	ACTG1, ACTB, MYLK2, CFL1, ARPC5, HRAS, VCL, ITGB7, PDGFC, ACTN4, TMSB4X, PFN1, MYL9, VAV3, BAIAP2, GSN, PIP5K1B, ARPC4, ARPC5L, CDC42, FGF19, PPP1CA, PPP1R12B, FGFR3, MYL12A, GNA12, FGF17, PIK3R3, BUB1B-PAK6, PAK6, VAV1, FGF5, NCKAP1L, SSH2, MYH9, FGF4, DIAPH1, BCAR1, MAPK3, PAK5, PDGFRA, RHOA, SSH3, CHRM1, MAP2K1, MYH10, ACTN1, PPP1R12C, FGFR1, PIP5K1C, FGF13, MYLK, LIMK2, F2, ITGA7, CYFIP1, ITGA11, DIAPH2, PAK4, MAP2K2, FGFR2, FGF20, ARPC2, PIK3R2, MSN, ARPC3, CHRM3, PDGFA, PDGFD, GIT1, VAV2, EZR, ITGA2
Alzheimer's disease	1.0e-04	0.004	-1.712	144	NDUFA2, NDUFA4, NDUF55, CALM3, NDUFA8, NDUF53, NDUFA1, NDUF56, NDUFB7, COX7B, COX8A, COX6B1, BACE2, SDHD, UQCRH, APOE, RYR3, NDUFC2, NDUFB3, COX4I1, COX7C, UQCR10, COX7A2, NDUFA11, PSENEN, MAPK3, RTN4, BAD, NDUF57, NDUF58, COX7A2L, GRIN2B, NDUFB9, NDUFA3, HSD17B10, CYC1, UQCRCQ, NDUFB6, NDUFC1, IL1B, CYCS, NDUFA6, COX5B, CAPN1, CACNA1D, NDUFB4, NDUFB2, NDUF54, UQCRC1, COX6A1, SNCA, ATP2A2, CDK5, MAPT, CACNA1C, UQCR11, GAPDH