

Supplementary Table 4

Pathway analysis of upregulated gene expression at ZT 4 in Bmal1<sup>0V</sup> (HFD) vs. Control (HFD)

GO: Pathway Name	P-value	Genes
regulation of hormone levels(4)	2.93E-07	ABCC8,ARNTL,ATP1A1,ATP6AP2,CPE,ERO1LB,G6PC2,GLP1R,HADH,HSD17B11,ICA1,INHA,KCNMA1,PCSK1,PCSK2,PTPRN,PTPRN2,SCG5,SLC30A8,SNAP25,TTR,UCN3
monocarboxylic acid metabolic process(7)	1.24E-04	ACAA2,ALDOB,APOA1,ATP8B1,CD74,CYP2C65,CYP2C66,CYP2C68,CYP2D26,CYP4F14,DGAT2,EGLN3,ERO1LB,FABP1,FABP2,GGT1,GPD1,HADH,P4HB,UGT2B34
peptide hormone processing(4)	1.24E-04	ATP6AP2,CPE,ERO1LB,PCSK1,PCSK2,SCG5
nitrogen compound transport(5)	6.96E-04	ABCC8,ACE2,ARNTL,CADPS,CD74,CDH17,CHGA,G6PC2,GLP1R,HADH,ICA1,MAOB,PTPRN,PTPRN2,SLC16A12,SLC30A8,SLC38A4,SLC7A14,SLC7A8,TTR,UCN3
regulation of secretion by cell(5)	7.82E-04	ABCC8,APOA1,ARNTL,ATP2A2,CADPS,CASP1,CHGA,G6PC2,GLP1R,HADH,ICA1,INHA,KRT20,MAOB,SCG5,SLC30A8,SNAP25,SPINK1,TRIM9,UCN3
signal release(5)	7.82E-04	ABCC8,ARNTL,ATP2A2,CADPS,G6PC2,GLP1R,HADH,ICA1,INHA,PTPRN,PTPRN2,SCG5,SLC30A8,SNAP25,TRIM9,UCN3
hormone metabolic process(3)	1.07E-03	ATP1A1,ATP6AP2,CPE,ERO1LB,HSD17B11,KCNMA1,PCSK1,PCSK2,SCG5,TTR
hormone transport(5)	1.07E-03	ABCC8,ARNTL,G6PC2,GLP1R,HADH,ICA1,INHA,PTPRN,PTPRN2,SCG5,SLC30A8,SNAP25,TTR,UCN3
protein maturation(5)	2.40E-03	AGA,ATP6AP2,CASP1,CD55,CPE,CR1L,ERO1LB,GGT1,PCSK1,PCSK2,PSENEN,SCG5,XDH
hormone secretion(6)	3.75E-03	ABCC8,ARNTL,G6PC2,GLP1R,HADH,ICA1,INHA,PTPRN,PTPRN2,SCG5,SLC30A8,SNAP25,UCN3
protein processing(6)	5.43E-03	ATP6AP2,CASP1,CD55,CPE,CR1L,ERO1LB,GGT1,PCSK1,PCSK2,PSENEN,SCG5,XDH
insulin secretion(6)	9.31E-03	ABCC8,ARNTL,G6PC2,GLP1R,HADH,ICA1,PTPRN,PTPRN2,SLC30A8,UCN3
digestion(4)	0.0096529	APOA1,FABP1,FABP2,KCNMA1,MUC13,PLS1,SLC5A1,UCN3
peptide secretion(6)	0.0104469	ABCC8,ARNTL,CD74,G6PC2,GLP1R,HADH,ICA1,PTPRN,PTPRN2,SLC30A8,UCN3
peptide transport(6)	0.0104469	ABCC8,ARNTL,CD74,CDH17,G6PC2,GLP1R,HADH,ICA1,PTPRN,PTPRN2,SLC30A8,UCN3
fatty acid metabolic process(5)	0.0105527	ACAA2,APOA1,CD74,CYP2C65,CYP2C66,CYP2C68,CYP2D26,CYP4F14,DGAT2,FABP1,FABP2,GGT1,HADH
antigen processing and presentation of exogenous antigen(4)	0.0108576	AP3D1,B2M,CD74,H2-AA,H2-AB1
intestinal absorption(5)	0.0108576	APOA1,FABP1,FABP2,PLS1,SLC5A1
regulation of hormone secretion(4)	0.0108576	ABCC8,ARNTL,G6PC2,GLP1R,HADH,ICA1,INHA,SCG5,SLC30A8,SNAP25,UCN3
amide transport(5)	0.0136476	ABCC8,ARNTL,CD74,CDH17,G6PC2,GLP1R,HADH,ICA1,PTPRN,PTPRN2,SLC30A8,UCN3
digestive system process(5)	0.0153102	APOA1,FABP1,FABP2,KCNMA1,MUC13,PLS1,SLC5A1
single organism membrane organization(4)	0.019579	ACAA2,AP3D1,ATP1B3,ATP2A2,ATP8B1,BSG,CDH1,CPE,GPR158,PIGR,PIK3R1,PLS1,SAMD9L,SNAP25,SOD1,SRP54A,TRIM9
peptide hormone secretion(7)	0.0297201	ABCC8,ARNTL,G6PC2,GLP1R,HADH,ICA1,PTPRN,PTPRN2,SLC30A8,UCN3
response to organonitrogen compound(4)	0.0297201	AKT3,ALDOB,APLP1,ATP2A2,CASP1,CDH1,GNAO1,GPD1,HSP90B1,MIR103-2,MIR421,MIR669C,PDGFD,PIK3R1,SELL,VKORC1
response to metal ion(5)	0.030642	ABCC8,ALDOB,B2M,CDH1,KCNMA1,LCT,SLC30A8,SOD1,XDH
fatty acid derivative metabolic process(4)&icosanoid metabolic process(5)	0.037621	CD74,CYP2C65,CYP2C66,CYP2C68,CYP2D26,CYP4F14,GGT1
response to transition metal nanoparticle(4)	0.037621	ABCC8,ALDOB,B2M,LCT,SLC30A8,SOD1
regulation of peptide secretion(6)	0.0391577	ABCC8,ARNTL,CD74,G6PC2,GLP1R,HADH,ICA1,SLC30A8,UCN3
response to endoplasmic reticulum stress(5)	0.0392982	DNAJB9,DNAJC3,EDEM2,HSP90B1,P4HB,PIK3R1,SDF2L1,SERINC3,UFM1
unsaturated fatty acid metabolic process(6)	0.0449138	CD74,CYP2C65,CYP2C66,CYP2C68,CYP2D26,CYP4F14,GGT1
regulation of insulin secretion(6)	0.0468611	ABCC8,ARNTL,G6PC2,GLP1R,HADH,ICA1,SLC30A8,UCN3
response to drug(4)	0.0468611	ATP1A1,ATP8B1,CASP1,CYP2C65,CYP2C66,CYP2C68,CYP2D26,HADH,LCT,SOD1
steroid metabolic process(5)	0.0499935	APOA1,APOB,ATP1A1,ATP8B1,DGAT2,GC,HSD17B11,KCNMA1,MTTP,SOD1

KEGG: Pathway Name	P-value	Genes
Carbohydrate digestion and absorption	3.34E-07	AKT3,ATP1A1,ATP1B3,G6PC2,LCT,MGAM,PIK3R1,SIS,SLC5A1
Energy Metabolism	6.56E-06	ACAA2,AKP3,ALDOB,ALPI,CYP3A13,GALM,GAPDH-PS15,HADH,MCEE,MDH2,PAPSS2,XDH
Fat digestion and absorption	2.27E-05	APOA1,APOB,DGAT2,FABP1,FABP2,MTTP,PLPP3
Starch and sucrose metabolism	0.00173621	ENPP3,G6PC2,MGAM,SIS,TREH,UGT2B34
Type I diabetes mellitus	0.00250559	CPE,H2-AA,H2-AB1,ICA1,PTPRN,PTPRN2
Ribosome	0.00511998	GM11703,GM15501,RPL29,RPL31-PS12,RPL4,RPL1,RPS26,RPS6-PS4
Alzheimer's disease	0.00939374	ATP2A2,ATP2A3,COX7A2,GAPDH-PS15,GM3873,MME,NDUFA1,PSENEN
Insulin secretion	9.39E-03	ABCC8,ATP1A1,ATP1B3,GLP1R,KCNMA1,SNAP25
Lysosome	9.39E-03	AGA,AP3D1,CD164,CD63,CTSB,GNPTG,PSAP
Protein processing in endoplasmic reticulum	9.39E-03	DNAJC3,EDEM2,ERO1LB,GM10177,HSP90B1,P4HB,RPN1,SSR2
Steroid hormone biosynthesis	0.00939374	CYP2C65,CYP2C66,CYP2C68,CYP2D26,CYP3A13,UGT2B34
Serotonergic synapse	0.0117866	CYP2C65,CYP2C66,CYP2C68,CYP2D26,GNAO1,GNG12,MAOB
Galactose metabolism	0.0148177	G6PC2,LCT,MGAM,SIS
Pancreatic secretion	0.0163437	ATP1A1,ATP1B3,ATP2A2,ATP2A3,CLCA4B,KCNMA1
HIF-1 signaling pathway	0.0227949	AKT3,EGLN3,GAPDH-PS15,PIK3R1,RPS6-PS4,TCEB1
Influenza A	0.0317502	AKT3,CASP1,DNAJC3,H2-AA,H2-AB1,IFNAR2,PIK3R1
PI3K-Akt signaling pathway	0.0331565	AKT3,CND2,G6PC2,GNG12,HSP90B1,IFNAR2,PDGFD,PGF,PIK3R1,RPS6-PS4
Antigen processing and presentation	0.0363388	B2M,CD74,CTSB,H2-AA,H2-AB1
Retinol metabolism	0.0427719	CYP2C65,CYP2C66,CYP2C68,CYP3A13,UGT2B34
Protein digestion and absorption	0.0474683	ACE2,ATP1A1,ATP1B3,MME,SLC7A8
Chemical carcinogenesis	0.0499823	CYP2C65,CYP2C66,CYP2C68,CYP3A13,UGT2B34