**Supplementary materials**

**Supplementary Table 1:** The 41 overlapping DEmiRNAs in GSE31568, GSE24709 and GSE61741.

|  |  |
| --- | --- |
| Up-regulated | Down-regulated |
| hsa-miR-32 | hsa-miR-1468 |
| hsa-miR-1233 | hsa-miR-553 |
| hsa-miR-380\* | hsa-miR-130b\* |
| hsa-miR-384 | hsa-miR-184 |
| hsa-miR-216a | hsa-miR-1258 |
| hsa-miR-21\* | hsa-miR-224 |
| hsa-miR-182\* | hsa-miR-1246 |
| hsa-miR-452\* | hsa-miR-369-5p |
| hsa-miR-214 | hsa-miR-556-3p |
| hsa-miR-323-3p | hsa-miR-126\* |
| hsa-miR-566 | hsa-miR-450a |
| hsa-miR-554 |  |
| hsa-miR-491-3p |  |
| hsa-miR-127-5p |  |
| hsa-miR-634 |  |
| hsa-miR-136 |  |
| hsa-miR-492 |  |
| hsa-miR-597 |  |
| hsa-miR-217 |  |
| hsa-miR-205 |  |
| hsa-miR-548p |  |
| hsa-miR-646 |  |
| hsa-miR-1912 |  |
| hsa-miR-153 |  |
| hsa-miR-548o |  |
| hsa-miR-767-5p |  |
| hsa-miR-518b |  |
| hsa-miR-497 |  |
| hsa-miR-200a\* |  |
| hsa-miR-1291 |  |

\*：The mature miRNA is lower expression than another mature miRNA from the same predicted precursor.

**Supplementary Table 2:** The list of 231 autophagy genes from HADb

|  |  |
| --- | --- |
| Symbol | Name |
| *AMBRA1* | *autophagy/beclin-1 regulator 1* |
| *APOL1* | *apolipoprotein L, 1* |
| *ARNT* | *aryl hydrocarbon receptor nuclear translocator* |
| *ARSA* | *arylsulfatase A* |
| *ARSB* | *arylsulfatase B* |
| *ATF4* | *activating transcription factor 4 (tax-responsive enhancer element B67)* |
| *ATF6* | *activating transcription factor 6* |
| *ATG10* | *ATG10 autophagy related 10 homolog (S. cerevisiae)* |
| *ATG12* | *ATG12 autophagy related 12 homolog (S. cerevisiae)* |
| *ATG16L1* | *ATG16 autophagy related 16-like 1 (S. cerevisiae)* |
| *ATG16L2* | *ATG16 autophagy related 16-like 2 (S. cerevisiae)* |
| *ATG2A* | *ATG2 autophagy related 2 homolog A (S. cerevisiae)* |
| *ATG2B* | *ATG2 autophagy related 2 homolog B (S. cerevisiae)* |
| *ATG3* | *ATG3 autophagy related 3 homolog (S. cerevisiae)* |
| *ATG4A* | *ATG4 autophagy related 4 homolog A (S. cerevisiae)* |
| *ATG4B* | *ATG4 autophagy related 4 homolog B (S. cerevisiae)* |
| *ATG4C* | *ATG4 autophagy related 4 homolog C (S. cerevisiae)* |
| *ATG4D* | *ATG4 autophagy related 4 homolog D (S. cerevisiae)* |
| *ATG5* | *ATG5 autophagy related 5 homolog (S. cerevisiae)* |
| *ATG7* | *ATG7 autophagy related 7 homolog (S. cerevisiae)* |
| *ATG9A* | *ATG9 autophagy related 9 homolog A (S. cerevisiae)* |
| *ATG9B* | *ATG9 autophagy related 9 homolog B (S. cerevisiae)* |
| *ATIC* | *5-aminoimidazole-4-carboxamide ribonucleotide formyltransferase/IMP cyclohydrolase* |
| *BAG1* | *BCL2-associated athanogene* |
| *BAG3* | *BCL2-associated athanogene 3* |
| *BAK1* | *BCL2-antagonist/killer 1* |
| *BAX* | *BCL2-associated X protein* |
| *BCL2* | *B-cell CLL/lymphoma 2* |
| *BCL2L1* | *BCL2-like 1* |
| *BECN1* | *beclin 1, autophagy related* |
| *BID* | *BH3 interacting domain death agonist* |
| *BIRC5* | *baculoviral IAP repeat-containing 5* |
| *BIRC6* | *baculoviral IAP repeat-containing 6* |
| *BNIP1* | *BCL2/adenovirus E1B 19kDa interacting protein 1* |
| *BNIP3* | *BCL2/adenovirus E1B 19kDa interacting protein 3* |
| *BNIP3L* | *BCL2/adenovirus E1B 19kDa interacting protein 3-like* |
| *C12orf44* | *chromosome 12 open reading frame 44* |
| *C17orf88* | *chromosome 17 open reading frame 88* |
| *CALCOCO2* | *calcium binding and coiled-coil domain 2* |
| *CAMKK2* | *calcium/calmodulin-dependent protein kinase kinase 2, beta* |
| *CANX* | *calnexin* |
| *CAPN1* | *calpain 1, (mu/I) large subunit* |
| *CAPN10* | *calpain 10* |
| *CAPN2* | *calpain 2, (m/II) large subunit* |
| *CAPNS1* | *calpain, small subunit 1* |
| *CASP1* | *caspase 1, apoptosis-related cysteine peptidase (interleukin 1, beta, convertase)* |
| *CASP3* | *caspase 3, apoptosis-related cysteine peptidase* |
| *CASP4* | *caspase 4, apoptosis-related cysteine peptidase* |
| *CASP8* | *caspase 8, apoptosis-related cysteine peptidase* |
| *CCL2* | *chemokine (C-C motif) ligand 2* |
| *CCR2* | *chemokine (C-C motif) receptor 2* |
| *CD46* | *CD46 molecule, complement regulatory protein* |
| *CDKN1A* | *cyclin-dependent kinase inhibitor 1A (p21, Cip1)* |
| *CDKN1B* | *cyclin-dependent kinase inhibitor 1B (p27, Kip1)* |
| *CDKN2A* | *cyclin-dependent kinase inhibitor 2A (melanoma, p16, inhibits CDK4)* |
| *CFLAR* | *CASP8 and FADD-like apoptosis regulator* |
| *CHMP2B* | *chromatin modifying protein 2B* |
| *CHMP4B* | *chromatin modifying protein 4B* |
| *CLN3* | *ceroid-lipofuscinosis, neuronal 3* |
| *CTSB* | *cathepsin B* |
| *CTSD* | *cathepsin D* |
| *CTSL1* | *cathepsin L1* |
| *CX3CL1* | *chemokine (C-X3-C motif) ligand 1* |
| *CXCR4* | *chemokine (C-X-C motif) receptor 4* |
| *DAPK1* | *death-associated protein kinase 1* |
| *DAPK2* | *death-associated protein kinase 2* |
| *DDIT3* | *DNA-damage-inducible transcript 3* |
| *DIRAS3* | *DIRAS family, GTP-binding RAS-like 3* |
| *DLC1* | *deleted in liver cancer 1* |
| *DNAJB1* | *DnaJ (Hsp40) homolog, subfamily B, member 1* |
| *DNAJB9* | *DnaJ (Hsp40) homolog, subfamily B, member 9* |
| *DRAM1* | *DNA-damage regulated autophagy modulator 1* |
| *EDEM1* | *ER degradation enhancer, mannosidase alpha-like 1* |
| *EEF2* | *eukaryotic translation elongation factor 2* |
| *EEF2K* | *eukaryotic elongation factor-2 kinase* |
| *EGFR* | *epidermal growth factor receptor (erythroblastic leukemia viral (v-erb-b) oncogene homolog, avian)* |
| *EIF2AK2* | *eukaryotic translation initiation factor 2-alpha kinase 2* |
| *EIF2AK3* | *eukaryotic translation initiation factor 2-alpha kinase 3* |
| *EIF2S1* | *eukaryotic translation initiation factor 2, subunit 1 alpha, 35kDa* |
| *EIF4EBP1* | *eukaryotic translation initiation factor 4E binding protein 1* |
| *EIF4G1* | *eukaryotic translation initiation factor 4 gamma, 1* |
| *ERBB2* | *v-erb-b2 erythroblastic leukemia viral oncogene homolog 2, neuro/glioblastoma derived oncogene homolog (avian)* |
| *ERN1* | *endoplasmic reticulum to nucleus signaling 1* |
| *ERO1L* | *ERO1-like (S. cerevisiae)* |
| *FADD* | *Fas (TNFRSF6)-associated via death domain* |
| *FAM48A* | *family with sequence similarity 48, member A* |
| *FAS* | *Fas (TNF receptor superfamily, member 6)* |
| *FKBP1A* | *FK506 binding protein 1A, 12kDa* |
| *FKBP1B* | *FK506 binding protein 1B, 12.6 kDa* |
| *FOS* | *FBJ murine osteosarcoma viral oncogene homolog* |
| *FOXO1* | *forkhead box O1* |
| *FOXO3* | *forkhead box O3* |
| *GAA* | *glucosidase, alpha; acid* |
| *GABARAP* | *GABA(A) receptor-associated protein* |
| *GABARAPL1* | *GABA(A) receptor-associated protein like 1* |
| *GABARAPL2* | *GABA(A) receptor-associated protein-like 2* |
| *GAPDH* | *glyceraldehyde-3-phosphate dehydrogenase* |
| *GNAI3* | *guanine nucleotide binding protein (G protein), alpha inhibiting activity polypeptide 3* |
| *GNB2L1* | *guanine nucleotide binding protein (G protein), beta polypeptide 2-like 1* |
| *GOPC* | *golgi-associated PDZ and coiled-coil motif containing* |
| *GRID1* | *glutamate receptor, ionotropic, delta 1* |
| *GRID2* | *glutamate receptor, ionotropic, delta 2* |
| *HDAC1* | *histone deacetylase 1* |
| *HDAC6* | *histone deacetylase 6* |
| *HGS* | *hepatocyte growth factor-regulated tyrosine kinase substrate* |
| *HIF1A* | *hypoxia inducible factor 1, alpha subunit (basic helix-loop-helix transcription factor)* |
| *HSP90AB1* | *heat shock protein 90kDa alpha (cytosolic), class B member 1* |
| *HSPA5* | *heat shock 70kDa protein 5 (glucose-regulated protein, 78kDa)* |
| *HSPA8* | *heat shock 70kDa protein 8* |
| *HSPB8* | *heat shock 22kDa protein 8* |
| *IFNG* | *interferon, gamma* |
| *IKBKB* | *inhibitor of kappa light polypeptide gene enhancer in B-cells, kinase beta* |
| *IKBKE* | *inhibitor of kappa light polypeptide gene enhancer in B-cells, kinase epsilon* |
| *IL24* | *interleukin 24* |
| *IRGM* | *immunity-related GTPase family, M* |
| *ITGA3* | *integrin, alpha 3 (antigen CD49C, alpha 3 subunit of VLA-3 receptor)* |
| *ITGA6* | *integrin, alpha 6* |
| *ITGB1* | *integrin, beta 1 (fibronectin receptor, beta polypeptide, antigen CD29 includes MDF2, MSK12)* |
| *ITGB4* | *integrin, beta 4* |
| *ITPR1* | *inositol 1,4,5-triphosphate receptor, type 1* |
| *GAA* | *glucosidase, alpha; acid* |
| *GABARAP* | *GABA(A) receptor-associated protein* |
| *GABARAPL1* | *GABA(A) receptor-associated protein like 1* |
| *GABARAPL2* | *GABA(A) receptor-associated protein-like 2* |
| *GAPDH* | *glyceraldehyde-3-phosphate dehydrogenase* |
| *GNAI3* | *guanine nucleotide binding protein (G protein), alpha inhibiting activity polypeptide 3* |
| *GNB2L1* | *guanine nucleotide binding protein (G protein), beta polypeptide 2-like 1* |
| *GOPC* | *golgi-associated PDZ and coiled-coil motif containing* |
| *GRID1* | *glutamate receptor, ionotropic, delta 1* |
| *GRID2* | *glutamate receptor, ionotropic, delta 2* |
| *KIAA0226* | *KIAA0226* |
| *KIAA0652* | *KIAA0652* |
| *KIAA0831* | *KIAA0831* |
| *KIF5B* | *kinesin family member 5B* |
| *KLHL24* | *kelch-like 24 (Drosophila)* |
| *LAMP1* | *lysosomal-associated membrane protein 1* |
| *LAMP2* | *lysosomal-associated membrane protein 2* |
| *MAP1LC3A* | *microtubule-associated protein 1 light chain 3 alpha* |
| *MAP1LC3B* | *microtubule-associated protein 1 light chain 3 beta* |
| *MAP1LC3C* | *microtubule-associated protein 1 light chain 3 gamma* |
| *MAP2K7* | *mitogen-activated protein kinase kinase 7* |
| *MAPK1* | *mitogen-activated protein kinase 1* |
| *MAPK3* | *mitogen-activated protein kinase 3* |
| *MAPK8* | *mitogen-activated protein kinase 8* |
| *MAPK8IP1* | *mitogen-activated protein kinase 8 interacting protein 1* |
| *MAPK9* | *mitogen-activated protein kinase 9* |
| *MBTPS2* | *membrane-bound transcription factor peptidase, site 2* |
| *MLST8* | *MTOR associated protein, LST8 homolog (S. cerevisiae)* |
| *MTMR14* | *myotubularin related protein 14* |
| *MTOR* | *mechanistic target of rapamycin (serine/threonine kinase)* |
| *MYC* | *v-myc myelocytomatosis viral oncogene homolog (avian)* |
| *NAF1* | *nuclear assembly factor 1 homolog (S. cerevisiae)* |
| *NAMPT* | *nicotinamide phosphoribosyltransferase* |
| *NBR1* | *neighbor of BRCA1 gene 1* |
| *NCKAP1* | *NCK-associated protein 1* |
| *NFE2L2* | *nuclear factor (erythroid-derived 2)-like 2* |
| *NFKB1* | *nuclear factor of kappa light polypeptide gene enhancer in B-cells 1* |
| *NKX2-3* | *NK2 transcription factor related, locus 3 (Drosophila)* |
| *NLRC4* | *NLR family, CARD domain containing 4* |
| *NPC1* | *Niemann-Pick disease, type C1* |
| *NRG1* | *neuregulin 1* |
| *NRG2* | *neuregulin 2* |
| *NRG3* | *neuregulin 3* |
| *P4HB* | *prolyl 4-hydroxylase, beta polypeptide* |
| *PARK2* | *Parkinson disease (autosomal recessive, juvenile) 2, parkin* |
| *PARP1* | *poly (ADP-ribose) polymerase 1* |
| *PEA15* | *phosphoprotein enriched in astrocytes 15* |
| *PELP1* | *proline, glutamate and leucine rich protein 1* |
| *PEX14* | *peroxisomal biogenesis factor 14* |
| *PEX3* | *peroxisomal biogenesis factor 3* |
| *PIK3C3* | *phosphoinositide-3-kinase, class 3* |
| *PIK3R4* | *phosphoinositide-3-kinase, regulatory subunit 4* |
| *PINK1* | *PTEN induced putative kinase 1* |
| *PPP1R15A* | *protein phosphatase 1, regulatory (inhibitor) subunit 15A* |
| *PRKAB1* | *protein kinase, AMP-activated, beta 1 non-catalytic subunit* |
| *PRKAR1A* | *protein kinase, cAMP-dependent, regulatory, type I, alpha (tissue specific extinguisher 1)* |
| *PRKCD* | *protein kinase C, delta* |
| *PRKCQ* | *protein kinase C, theta* |
| *PTEN* | *phosphatase and tensin homolog* |
| *PTK6* | *PTK6 protein tyrosine kinase 6* |
| *RAB11A* | *RAB11A, member RAS oncogene family* |
| *RAB1A* | *RAB1A, member RAS oncogene family* |
| *RAB24* | *RAB24, member RAS oncogene family* |
| *RAB33B* | *RAB33B, member RAS oncogene family* |
| *RAB5A* | *RAB5A, member RAS oncogene family* |
| *RAB7A* | *RAB7A, member RAS oncogene family* |
| *RAC1* | *ras-related C3 botulinum toxin substrate 1 (rho family, small GTP binding protein Rac1)* |
| *RAF1* | *v-raf-1 murine leukemia viral oncogene homolog 1* |
| *RB1* | *retinoblastoma 1* |
| *RB1CC1* | *RB1-inducible coiled-coil 1* |
| *RELA* | *v-rel reticuloendotheliosis viral oncogene homolog A (avian)* |
| *RGS19* | *regulator of G-protein signaling 19* |
| *RHEB* | *Ras homolog enriched in brain* |
| *RPS6KB1* | *ribosomal protein S6 kinase, 70kDa, polypeptide 1* |
| *RPTOR* | *regulatory associated protein of MTOR, complex 1* |
| *SAR1A* | *SAR1 homolog A (S. cerevisiae)* |
| *SERPINA1* | *serpin peptidase inhibitor, clade A (alpha-1 antiproteinase, antitrypsin), member 1* |
| *SESN2* | *sestrin 2* |
| *SH3GLB1* | *SH3-domain GRB2-like endophilin B1* |
| *SIRT1* | *sirtuin (silent mating type information regulation 2 homolog) 1 (S. cerevisiae)* |
| *SIRT2* | *sirtuin (silent mating type information regulation 2 homolog) 2 (S. cerevisiae)* |
| *SPHK1* | *sphingosine kinase 1* |
| *SPNS1* | *spinster homolog 1 (Drosophila)* |
| *SQSTM1* | *sequestosome 1* |
| *ST13* | *suppression of tumorigenicity 13 (colon carcinoma) (Hsp70 interacting protein)* |
| *STK11* | *serine/threonine kinase 11* |
| *TBK1* | *TANK-binding kinase 1* |
| *TM9SF1* | *transmembrane 9 superfamily member 1* |
| *TMEM49* | *transmembrane protein 49* |
| *TMEM74* | *transmembrane protein 74* |
| *TNFSF10* | *tumor necrosis factor (ligand) superfamily, member 10* |
| *TP53* | *tumor protein p53* |
| *TP53INP2* | *tumor protein p53 inducible nuclear protein 2* |
| *TP63* | *tumor protein p63* |
| *TP73* | *tumor protein p73* |
| *TSC1* | *tuberous sclerosis 1* |
| *TSC2* | *tuberous sclerosis 2* |
| *TUSC1* | *tumor suppressor candidate 1* |
| *ULK1* | *unc-51-like kinase 1 (C. elegans)* |
| *ULK2* | *unc-51-like kinase 2 (C. elegans)* |
| *ULK3* | *unc-51-like kinase 3 (C. elegans)* |
| *USP10* | *ubiquitin specific peptidase 10* |
| *UVRAG* | *UV radiation resistance associated gene* |
| *VAMP3* | *vesicle-associated membrane protein 3 (cellubrevin)* |
| *VAMP7* | *vesicle-associated membrane protein 7* |
| *VEGFA* | *vascular endothelial growth factor A* |
| *WDFY3* | *WD repeat and FYVE domain containing 3* |
| *WDR45* | *WD repeat domain 45* |
| *WDR45L* | *WDR45-like* |
| *WIPI1* | *WD repeat domain, phosphoinositide interacting 1* |
| *WIPI2* | *WD repeat domain, phosphoinositide interacting 2* |

**Supplementary Table 3:** The list of 38 autophagy-related genes in COPD.

|  |  |
| --- | --- |
| Symbol | Name |
| *PTEN* | *phosphatase and tensin homolog* |
| *BAK1* | *BCL2-antagonist/killer 1* |
| *GABARAP* | *GABA(A) receptor-associated protein* |
| *CDKN1B* | *cyclin-dependent kinase inhibitor 1B (p27, Kip1)* |
| *BCL2* | *B-cell CLL/lymphoma 2* |
| *KIF5B* | *kinesin family member 5B* |
| *SH3GLB1* | *SH3-domain GRB2-like endophilin B1* |
| *ATG10* | *ATG10 autophagy related 10 homolog (S. cerevisiae)* |
| *TP53INP2* | *tumor protein p53 inducible nuclear protein 2* |
| *CHMP2B* | *chromatin modifying protein 2B* |
| *RAF1* | *v-raf-1 murine leukemia viral oncogene homolog 1* |
| *PRKAR1A* | *protein kinase, cAMP-dependent, regulatory, type I, alpha (tissue specific extinguisher 1)* |
| *WIPI2* | *WD repeat domain, phosphoinositide interacting 2* |
| *ITPR1* | *inositol 1,4,5-triphosphate receptor, type 1* |
| *ITGA6* | *integrin, alpha 6* |
| *GABARAPL1* | *GABA(A) receptor-associated protein like 1* |
| *VEGFA* | *vascular endothelial growth factor A* |
| *ATG9A* | *ATG9 autophagy related 9 homolog A (S. cerevisiae)* |
| *SAR1A* | *SAR1 homolog A (S. cerevisiae)* |
| *CHMP4B* | *chromatin modifying protein 4B* |
| *CASP3* | *caspase 3, apoptosis-related cysteine peptidase* |
| *NCKAP1* | *NCK-associated protein 1* |
| *UVRAG* | *UV radiation resistance associated gene* |
| *NAMPT* | *nicotinamide phosphoribosyltransferase* |
| *MAPK1* | *mitogen-activated protein kinase 1* |
| *TSC1* | *tuberous sclerosis 1* |
| *IKBKB* | *inhibitor of kappa light polypeptide gene enhancer in B-cells, kinase beta* |
| *MAPK8* | *mitogen-activated protein kinase 8* |
| *DNAJB9* | *DnaJ (Hsp40) homolog, subfamily B, member 9* |
| *EIF4EBP1* | *eukaryotic translation initiation factor 4E binding protein 1* |
| *EDEM1* | *ER degradation enhancer, mannosidase alpha-like 1* |
| *RB1* | *retinoblastoma 1* |
| *RAB1A* | *RAB1A, member RAS oncogene family* |
| *SIRT1* | *sirtuin (silent mating type information regulation 2 homolog) 1 (S. cerevisiae)* |
| *BECN1* | *beclin 1, autophagy related* |
| *FOXO3* | *forkhead box O3* |
| *FKBP1A* | *FK506 binding protein 1A, 12kDa* |
| *RPS6KB1* | *ribosomal protein S6 kinase, 70kDa, polypeptide 1* |