GSVA Hallmark gene sets

```
library(GSEABase)
```

```
## Loading required package: BiocGenerics
```

```
## Loading required package: parallel
```

```
##
## Attaching package: 'BiocGenerics'
```

```
## The following objects are masked from 'package:parallel':
##
##     clusterApply, clusterApplyLB, clusterCall, clusterEvalQ,
##     clusterExport, clusterMap, parApply, parCapply, parLapply,
##     parLapplyLB, parRapply, parSapply, parSapplyLB
```

```
## The following objects are masked from 'package:stats':
##
##     IQR, mad, sd, var, xtabs
```

```
## The following objects are masked from 'package:base':
##
##     anyDuplicated, append, as.data.frame, basename, cbind, colMeans,
##     colnames, colSums, dirname, do.call, duplicated, eval, evalq,
##     Filter, Find, get, grep, grepl, intersect, is.unsorted, lapply,
##     lengths, Map, mapply, match, mget, order, paste, pmax, pmax.int,
##     pmin, pmin.int, Position, rank, rbind, Reduce, rowMeans, rownames,
##     rowSums, sapply, setdiff, sort, table, tapply, union, unique,
##     unsplit, which, which.max, which.min
```

```
## Loading required package: Biobase
```

```
## Welcome to Bioconductor
##
##     Vignettes contain introductory material; view with
##     'browseVignettes()'. To cite Bioconductor, see
##     'citation("Biobase")', and for packages 'citation("pkgname")'.
```

```
## Loading required package: annotate
```

```
## Loading required package: AnnotationDbi
```

```
## Loading required package: stats4
```

```
## Loading required package: IRanges

## Loading required package: S4Vectors

##
## Attaching package: 'S4Vectors'

## The following object is masked from 'package:base':
##
##     expand.grid

## Loading required package: XML

## Loading required package: graph

##
## Attaching package: 'graph'

## The following object is masked from 'package:XML':
##
##     addNode
```

```
library(GSVA)
library(pheatmap)
setwd('../GSVA_flt_res0.3/')

genesetGmt <- '../h.all.v7.2.symbols.gmt'

exprSet <- readRDS('tmp/exprSet.Rds'); nrow(exprs(exprSet))
```

```
## [1] 18723
```

```
### Get gene sets ###
geneSet <- read.delim(genesetGmt, header = F, row.names = 1); nrow(geneSet)
```

```
## [1] 50
```

```
rownames(geneSet) <- unlist(lapply(rownames(geneSet), function(x) unlist(strsplit(as.character(x), spli
geneSet[1:4, 1:4]
```

```
##                                                                                                  V
## TNFA_SIGNALING_VIA_NFKB http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_TNFA_SIGNALING_VIA_NFK
## HYPOXIA                                    http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_HYPOXI
## CHOLESTEROL_HOMEOSTASIS http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_CHOLESTEROL_HOMEOSTASI
## MITOTIC_SPINDLE                 http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_MITOTIC_SPINDL
##                               V3      V4    V5
## TNFA_SIGNALING_VIA_NFKB     JUNB   CXCL2  ATF3
## HYPOXIA                     PGK1    PDK1  GBE1
## CHOLESTEROL_HOMEOSTASIS     FDPS CYP51A1  IDI1
## MITOTIC_SPINDLE          ARHGEF2  CLASP1 KIF11
```

```
head(geneSet$V2)
```

```
## [1] http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_TNFA_SIGNALING_VIA_NFKB
## [2] http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_HYPOXIA
## [3] http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_CHOLESTEROL_HOMEOSTASIS
## [4] http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_MITOTIC_SPINDLE
## [5] http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_WNT_BETA_CATENIN_SIGNALING
## [6] http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_TGF_BETA_SIGNALING
## 50 Levels: http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_ADIPOGENESIS ...
```

```
gsInfo <- data.frame(row.names = rownames(geneSet), Source = geneSet$V2); head(gsInfo)
```

```
##
## TNFA_SIGNALING_VIA_NFKB       http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_TNFA_SIGNALING_VI
## HYPOXIA                                  http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_H
## CHOLESTEROL_HOMEOSTASIS       http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_CHOLESTEROL_HOMEO
## MITOTIC_SPINDLE                     http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_MITOTIC_S
## WNT_BETA_CATENIN_SIGNALING http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_WNT_BETA_CATENIN_SIG
## TGF_BETA_SIGNALING               http://www.gsea-msigdb.org/gsea/msigdb/cards/HALLMARK_TGF_BETA_SIG
```

```
geneSet$V2 <- NULL
geneSet <- data.frame(t(geneSet), check.names = F, check.rows = F)
geneSet[1:4, 1:4]
```

```
##    TNFA_SIGNALING_VIA_NFKB HYPOXIA CHOLESTEROL_HOMEOSTASIS MITOTIC_SPINDLE
## V3                    JUNB    PGK1                    FDPS         ARHGEF2
## V4                   CXCL2    PDK1                  CYP51A1          CLASP1
## V5                    ATF3    GBE1                     IDI1           KIF11
## V6                  NFKBIA    PFKL                   FDFT1           KIF23
```

```
head(geneSet)
```

```
##    TNFA_SIGNALING_VIA_NFKB HYPOXIA CHOLESTEROL_HOMEOSTASIS MITOTIC_SPINDLE
## V3                    JUNB    PGK1                    FDPS         ARHGEF2
## V4                   CXCL2    PDK1                  CYP51A1          CLASP1
## V5                    ATF3    GBE1                     IDI1           KIF11
## V6                  NFKBIA    PFKL                   FDFT1           KIF23
## V7                 TNFAIP3   ALDOA                   DHCR7            ALS2
## V8                   PTGS2    ENO2                    SQLE            ARF6
##    WNT_BETA_CATENIN_SIGNALING TGF_BETA_SIGNALING IL6_JAK_STAT3_SIGNALING
## V3                        MYC             TGFBR1                    IL4R
## V4                     CTNNB1              SMAD7                   IL6ST
## V5                       JAG2              TGFB1                   STAT1
## V6                     NOTCH1             SMURF2                   IL1R1
## V7                       DLL1             SMURF1                  CSF2RB
## V8                      AXIN2              BMPR2                   SOCS3
##    DNA_REPAIR G2M_CHECKPOINT APOPTOSIS NOTCH_SIGNALING ADIPOGENESIS
## V3     POLR2H          AURKA     CASP3            JAG1        FABP4
## V4     POLR2A          CCNA2     CASP9          NOTCH3       ADIPOQ
## V5     POLR2G          TOP2A      DFFA          NOTCH2        PPARG
## V6     POLR2E          CCNB2     CASP7           APH1A         LIPE
```

```
## V7     POLR2J          CENPA     CFLAR            HES1        DGAT1
## V8     POLR2F          BIRC5     BIRC3           CCND1          LPL
##    ESTROGEN_RESPONSE_EARLY ESTROGEN_RESPONSE_LATE ANDROGEN_RESPONSE MYOGENESIS
## V3                    GREB1                  TFF1              KLK3      ACTA1
## V4                     CA12               SLC9A3R1              KLK2      TNNI2
## V5                 SLC9A3R1               TPD52L1             ACSL3       MYL1
## V6                      MYB                PRSS23             PIAS1      TNNC1
## V7                    ANXA9                  CA12            CAMKK2      TNNC2
## V8                   IGFBP4                 PDZK1            NKX3-1       MYH3
##    PROTEIN_SECRETION INTERFERON_ALPHA_RESPONSE INTERFERON_GAMMA_RESPONSE
## V3             ARCN1                      MX1                     STAT1
## V4            TMED10                    ISG15                     ISG15
## V5             COPB2                     OAS1                     IFIT1
## V6             RAB14                    IFIT3                       MX1
## V7             ATP7A                    IFI44                     IFIT3
## V8             COPB1                    IFI35                     IFI35
##    APICAL_JUNCTION APICAL_SURFACE HEDGEHOG_SIGNALING COMPLEMENT
## V3           ACTN1        B4GALT1                SHH         C2
## V4           CLDN7           RHCG              PTCH1        C1S
## V5           ACTN3            MAL              NRCAM        CFB
## V6         CLDN19          LYPD3               NRP1        C1R
## V7           DLG1          PKHD1               SCG2   SERPINE1
## V8           TJP1       ATP6V0A4               AMOT      MMP14
##    UNFOLDED_PROTEIN_RESPONSE PI3K_AKT_MTOR_SIGNALING MTORC1_SIGNALING
## V3                      ATF4                  MAPK8            FADS1
## V4                   HERPUD1                 PIK3R3            DDIT4
## V5                      PARN                   GRB2             CALR
## V6                    EXOSC4                 NFKBIB              HK2
## V7                    HSP90B1                MAP2K6             PGK1
## V8                      XBP1                  MAPK9           SLC7A5
##    E2F_TARGETS MYC_TARGETS_V1 MYC_TARGETS_V2 EPITHELIAL_MESENCHYMAL_TRANSITION
## V3       AURKA           PCNA        SLC19A1                            COL3A1
## V4       BRCA2          PSMD8          MRTO4                            COL5A2
## V5      CCP110          PSMD7         TMEM97                            COL5A1
## V6       CENPE            SET           RRP9                              FBN1
## V7        CKS2         SNRPA1           PES1                            COL1A1
## V8     DCLRE1B            RAN          TFB2M                               FN1
##    INFLAMMATORY_RESPONSE XENOBIOTIC_METABOLISM FATTY_ACID_METABOLISM
## V3                CXCL10                CYP1A1                ACAA1
## V4                  CCL2                   FAH                ACAA2
## V5                  CCL5                  DCXR                ACADL
## V6                  FPR1                CYP1A2                ACADM
## V7                 CCL20                 GSTA3                ACOT8
## V8                  IL1A                CYP2J2                ACOX1
##    OXIDATIVE_PHOSPHORYLATION GLYCOLYSIS REACTIVE_OXYGEN_SPECIES_PATHWAY
## V3                    NDUFS3       PGK1                            GSR
## V4                     UQCRB      ALDOA                          PRDX2
## V5                    NDUFS2       ENO1                         TXNRD1
## V6                      SDHA       TPI1                           SOD1
## V7                    UQCRC1       PFKP                           GCLC
## V8                    NDUFA9      ERO1A                            CAT
##    P53_PATHWAY UV_RESPONSE_UP UV_RESPONSE_DN ANGIOGENESIS HEME_METABOLISM
## V3     CDKN1A           NXF1           TJP1         VCAN           ALAS2
## V4       BTG2         SLC6A8           NFIB        POSTN            PPOX
```

```
## V5        MDM2           BAK1         TGFBR3        FSTL1            FECH
## V6       CCNG1          CDC5L           TFPI       LRPAP1            HMBS
## V7         FAS          HSPA2          MMP16         STC1            GYPB
## V8        TOB1         POLR2H          ABCC1          LPL            ALAD
##    COAGULATION IL2_STAT5_SIGNALING BILE_ACID_METABOLISM PEROXISOME
## V3          F2               SOCS2                SCP2      ABCD3
## V4        PROC                CISH              ABCD3      ACOT8
## V5         C1S                PIM1             SLC27A2      ACOX1
## V6       MMP14               IL2RA              HSD3B7      ACSL1
## V7         F10             TNFRSF4             HSD17B4       ECH1
## V8         PLG               SOCS1              AKR1D1       ECI2
##    ALLOGRAFT_REJECTION SPERMATOGENESIS KRAS_SIGNALING_UP KRAS_SIGNALING_DN
## V3               PTPRC           PDHA2           ANGPTL4             CDH16
## V4               IL12B           TSSK2             ITGA2            SPTBN2
## V5               TGFB1            TNP1             SPRY2             FGFR3
## V6               IL12A            ZPBP             HBEGF              NOS1
## V7                CD3E           DPEP3              RBP4             PDE6B
## V8                CD3D           ADAM2           HSD11B1             SIDT1
##    PANCREAS_BETA_CELLS
## V3                PAX6
## V4             NEUROD1
## V5                ISL1
## V6              NKX2-2
## V7               PCSK1
## V8              NKX6-1
```

```
gsInfo <- AnnotatedDataFrame(data=gsInfo)
identical(rownames(pData(gsInfo)), colnames(geneSet))
```

```
## [1] TRUE
```

```
signatureSet <- ExpressionSet(as.matrix(geneSet), phenoData=gsInfo)
exprs(signatureSet)
```

```
##      TNFA_SIGNALING_VIA_NFKB HYPOXIA    CHOLESTEROL_HOMEOSTASIS MITOTIC_SPINDLE
## V3   "JUNB"                  "PGK1"     "FDPS"                  "ARHGEF2"
## V4   "CXCL2"                 "PDK1"     "CYP51A1"               "CLASP1"
## V5   "ATF3"                  "GBE1"     "IDI1"                  "KIF11"
## V6   "NFKBIA"                "PFKL"     "FDFT1"                 "KIF23"
## V7   "TNFAIP3"               "ALDOA"    "DHCR7"                 "ALS2"
## V8   "PTGS2"                 "ENO2"     "SQLE"                  "ARF6"
## V9   "CXCL1"                 "PGM1"     "HMGCS1"                "MYO9B"
## V10  "IER3"                  "NDRG1"    "NSDHL"                 "MYH9"
## V11  "CD83"                  "HK2"      "LSS"                   "TUBGCP3"
## V12  "CCL20"                 "ALDOC"    "MVD"                   "CKAP5"
## V13  "CXCL3"                 "GPI"      "LDLR"                  "RACGAP1"
## V14  "MAFF"                  "MXI1"     "TM7SF2"                "PREX1"
## V15  "NFKB2"                 "SLC2A1"   "ALDOC"                 "ARHGEF3"
## V16  "TNFAIP2"               "P4HA1"    "EBP"                   "NUMA1"
## V17  "HBEGF"                 "ADM"      "SCD"                   "SPTBN1"
## V18  "KLF6"                  "P4HA2"    "PMVK"                  "KIF2C"
## V19  "BIRC3"                 "ENO1"     "MVK"                   "KIF5B"
## V20  "PLAUR"                 "PFKP"     "LPL"                   "TTK"
```

```
## V21  "ZFP36"          "AK4"      "SC5D"          "APC"
## V22  "ICAM1"          "FAM162A"  "FADS2"         "CEP250"
## V23  "JUN"            "PFKFB3"   "HMGCR"         "PAFAH1B1"
## V24  "EGR3"           "VEGFA"    "HSD17B7"       "CDC42EP2"
## V25  "IL1B"           "BNIP3L"   "ANXA13"        "KIF3B"
## V26  "BCL2A1"         "TPI1"     "SREBF2"        "CCDC88A"
## V27  "PPP1R15A"       "ERO1A"    "PCYT2"         "KIF15"
## V28  "ZC3H12A"        "KDM3A"    "ACSS2"         "BIRC5"
## V29  "SOD2"           "CCNG2"    "ATF3"          "CNTROB"
## V30  "NR4A2"          "LDHA"     "ADH4"          "NF1"
## V31  "IL1A"           "GYS1"     "ETHE1"         "TSC1"
## V32  "RELB"           "GAPDH"    "ECH1"          "CDC27"
## V33  "TRAF1"          "BHLHE40"  "CBS"           "CNTRL"
## V34  "BTG2"           "ANGPTL4"  "GUSB"          "TUBGCP5"
## V35  "DUSP1"          "JUN"      "FASN"          "KIF4A"
## V36  "MAP3K8"         "SERPINE1" "LGALS3"        "MAPRE1"
## V37  "ETS2"           "LOX"      "ATF5"          "FGD6"
## V38  "F3"             "GCK"      "ANXA5"         "BRCA2"
## V39  "SDC4"           "PPFIA4"   "TP53INP1"      "PLK1"
## V40  "EGR1"           "MAFF"     "CHKA"          "RASA1"
## V41  "IL6"            "DDIT4"    "GSTM2"         "NEK2"
## V42  "TNF"            "SLC2A3"   "ACAT2"         "WASF1"
## V43  "KDM6B"          "IGFBP3"   "AVPR1A"        "TOP2A"
## V44  "NFKB1"          "NFIL3"    "PLSCR1"        "TRIO"
## V45  "LIF"            "FOS"      "CLU"           "ARHGEF11"
## V46  "PTX3"           "RBPJ"     "ERRFI1"        "KATNB1"
## V47  "FOSL1"          "HK1"      "TRIB3"         "PRC1"
## V48  "NR4A1"          "CITED2"   "CXCL16"        "ANLN"
## V49  "JAG1"           "ISG20"    "TNFRSF12A"     "CDK5RAP2"
## V50  "CCL4"           "GALK1"    "ACTG1"         "SMC3"
## V51  "GCH1"           "WSB1"     "JAG1"          "TUBGCP2"
## V52  "CCL2"           "PYGM"     "LGMN"          "ESPL1"
## V53  "RCAN1"          "STC1"     "FBXO6"         "MAP1S"
## V54  "DUSP2"          "ZNF292"   "GPX8"          "ARHGAP27"
## V55  "EHD1"           "BTG1"     "PNRC1"         "DOCK4"
## V56  "IER2"           "PLIN2"    "ANTXR2"        "SAC3D1"
## V57  "REL"            "CSRP2"    "MAL2"          "INCENP"
## V58  "CFLAR"          "VLDLR"    "CD9"           "ARHGAP5"
## V59  "RIPK2"          "JMJD6"    "PPARG"         "GSN"
## V60  "NFKBIE"         "EXT1"     "GLDC"          "NET1"
## V61  "NR4A3"          "F3"       "STX5"          "LRPPRC"
## V62  "PHLDA1"         "PDK3"     "STARD4"        "RABGAP1"
## V63  "IER5"           "ANKZF1"   "CTNNB1"        "FLNB"
## V64  "TNFSF9"         "UGP2"     "TMEM97"        "ARAP3"
## V65  "GEM"            "ALDOB"    "NIBAN1"        "FGD4"
## V66  "GADD45A"        "STC2"     "PDK3"          "ABR"
## V67  "CXCL10"         "ERRFI1"   "PLAUR"         "CENPJ"
## V68  "PLK2"           "ENO3"     "SEMA3B"        "NCK1"
## V69  "BHLHE40"        "PNRC1"    "GNAI1"         "CENPF"
## V70  "EGR2"           "HMOX1"    "ABCA2"         "KIF20B"
## V71  "SOCS3"          "PGF"      "ATXN2"         "WASF2"
## V72  "SLC2A6"         "GAPDHS"   "NFIL3"         "MYH10"
## V73  "PTGER4"         "CHST2"    "ALCAM"         "CENPE"
## V74  "DUSP5"          "TMEM45A"  "FABP5"         "CYTH2"
```

```
## V75  "SERPINB2"            "BCAN"     "S100A11"            "MID1"
## V76  "NFIL3"               "ATF3"     "CPEB2"              "KLC1"
## V77  "SERPINE1"            "CAV1"     ""                   "MARK4"
## V78  "TRIB1"               "AMPD3"    ""                   "ARL8A"
## V79  "TIPARP"              "GPC3"     ""                   "CEP57"
## V80  "RELA"                "NDST1"    ""                   "UXT"
## V81  "BIRC2"               "IRS2"     ""                   "ARHGAP4"
## V82  "CXCL6"               "SAP30"    ""                   "CDC42EP4"
## V83  "LITAF"               "GAA"      ""                   "SASS6"
## V84  "TNFAIP6"             "SDC4"     ""                   "LATS1"
## V85  "CD44"                "STBD1"    ""                   "OPHN1"
## V86  "INHBA"               "IER3"     ""                   "WASL"
## V87  "PLAU"                "PKLR"     ""                   "MAP3K11"
## V88  "MYC"                 "IGFBP1"   ""                   "SOS1"
## V89  "TNFRSF9"             "PLAUR"    ""                   "ABL1"
## V90  "SGK1"                "CAVIN3"   ""                   "TIAM1"
## V91  "TNIP1"               "CCN5"     ""                   "KIF1B"
## V92  "NAMPT"               "LARGE1"   ""                   "ITSN1"
## V93  "FOSL2"               "NOCT"     ""                   "SHROOM1"
## V94  "PNRC1"               "S100A4"   ""                   "NCK2"
## V95  "ID2"                 "RRAGD"    ""                   "DLGAP5"
## V96  "CD69"                "ZFP36"    ""                   "BCR"
## V97  "IL7R"                "EGFR"     ""                   "RANBP9"
## V98  "EFNA1"               "EDN2"     ""                   "EPB41L2"
## V99  "PHLDA2"              "IDS"      ""                   "SEPTIN9"
## V100 "PFKFB3"              "CDKN1A"   ""                   "KATNA1"
## V101 "CCL5"                "RORA"     ""                   "TUBD1"
## V102 "YRDC"                "DUSP1"    ""                   "TPX2"
## V103 "IFNGR2"              "MIF"      ""                   "KIF3C"
## V104 "SQSTM1"              "PPP1R3C"  ""                   "SHROOM2"
## V105 "BTG3"                "DPYSL4"   ""                   "TUBGCP6"
## V106 "GADD45B"             "KDELR3"   ""                   "SPTAN1"
## V107 "KYNU"                "DTNA"     ""                   "PALLD"
## V108 "G0S2"                "ADORA2B"  ""                   "ARFIP2"
## V109 "BTG1"                "HS3ST1"   ""                   "KNTC1"
## V110 "MCL1"                "CAVIN1"   ""                   "HOOK3"
## V111 "VEGFA"               "NR3C1"    ""                   "SUN2"
## V112 "MAP2K3"              "KLF6"     ""                   "MID1IP1"
## V113 "CDKN1A"              "GPC4"     ""                   "DLG1"
## V114 "CCN1"                "CCN1"     ""                   "FLNA"
## V115 "TANK"                "TNFAIP3"  ""                   "ARHGAP10"
## V116 "IFIT2"               "CA12"     ""                   "CDC42BPA"
## V117 "IL18"                "HEXA"     ""                   "ARHGEF12"
## V118 "TUBB2A"              "BGN"      ""                   "MARCKS"
## V119 "IRF1"                "PPP1R15A" ""                   "NIN"
## V120 "FOS"                 "PGM2"     ""                   "PCM1"
## V121 "OLR1"                "PIM1"     ""                   "RALBP1"
## V122 "RHOB"                "PRDX5"    ""                   "EZR"
## V123 "AREG"                "NAGK"     ""                   "SSH2"
## V124 "NINJ1"               "CDKN1B"   ""                   "CDK1"
## V125 "ZBTB10"              "BRS3"     ""                   "RAB3GAP1"
## V126 "PLPP3"               "TKTL1"    ""                   "FARP1"
## V127 "KLF4"                "MT1E"     ""                   "SYNPO"
## V128 "CXCL11"              "ATP7A"    ""                   "RHOF"
```

```
## V129 "SAT1"                "MT2A"     ""                "ECT2"
## V130 "CSF1"                "SDC3"     ""                "EPB41"
## V131 "GPR183"              "TIPARP"   ""                "RAPGEF6"
## V132 "PMEPA1"              "PKP1"     ""                "KIF22"
## V133 "PTPRE"               "ANXA2"    ""                "PCGF5"
## V134 "TLR2"                "PGAM2"    ""                "STAU1"
## V135 "ACKR3"               "DDIT3"    ""                "ARHGDIA"
## V136 "KLF10"               "PRKCA"    ""                "AURKA"
## V137 "MARCKS"              "SLC37A4"  ""                "FBXO5"
## V138 "LAMB3"               "CXCR4"    ""                "NUSAP1"
## V139 "CEBPB"               "EFNA3"    ""                "PXN"
## V140 "TRIP10"              "CP"       ""                "BCAR1"
## V141 "F2RL1"               "KLF7"     ""                "CD2AP"
## V142 "KLF9"                "CCN2"     ""                "AKAP13"
## V143 "LDLR"                "CHST3"    ""                "HDAC6"
## V144 "TGIF1"               "TPD52"    ""                "CEP131"
## V145 "RNF19B"              "LXN"      ""                "LLGL1"
## V146 "DRAM1"               "B4GALNT2" ""                "ATG4B"
## V147 "B4GALT1"             "PPARGC1A" ""                "PCNT"
## V148 "DNAJB4"              "BCL2"     ""                "ALMS1"
## V149 "CSF2"                "GCNT2"    ""                "KPTN"
## V150 "PDE4B"               "HAS1"     ""                "DST"
## V151 "SNN"                 "KLHL24"   ""                "KIFAP3"
## V152 "PLEK"                "SCARB1"   ""                "PPP4R2"
## V153 "STAT5A"              "SLC25A1"  ""                "ARHGAP29"
## V154 "DENND5A"             "SDC2"     ""                "RASAL2"
## V155 "CCND1"               "CASP6"    ""                "CCNB2"
## V156 "DDX58"               "VHL"      ""                "PIF1"
## V157 "SPHK1"               "FOXO3"    ""                "RASA2"
## V158 "CD80"                "PDGFB"    ""                "NEDD9"
## V159 "TNFAIP8"             "B3GALT6"  ""                "SMC1A"
## V160 "CCNL1"               "SLC2A5"   ""                "ACTN4"
## V161 "FUT4"                "SRPX"     ""                "PKD2"
## V162 "CCRL2"               "EFNA1"    ""                "CLIP2"
## V163 "SPSB1"               "GLRX"     ""                "CDC42"
## V164 "TSC22D1"             "ACKR3"    ""                "NDC80"
## V165 "B4GALT5"             "PAM"      ""                "TLK1"
## V166 "SIK1"                "TGFBI"    ""                "TAOK2"
## V167 "CLCF1"               "DCN"      ""                "TBCD"
## V168 "NFE2L2"              "SIAH2"    ""                "CAPZB"
## V169 "FOSB"                "PLAC8"    ""                "DOCK2"
## V170 "PER1"                "FBP1"     ""                "CTTN"
## V171 "NFAT5"               "TPST2"    ""                "SMC4"
## V172 "ATP2B1"              "PHKG1"    ""                "ARFGEF1"
## V173 "IL12B"               "MYH9"     ""                "TUBA4A"
## V174 "IL6ST"               "CDKN1C"   ""                "LMNB1"
## V175 "SLC16A6"             "GRHPR"    ""                "ABI1"
## V176 "ABCA1"               "PCK1"     ""                "ROCK1"
## V177 "HES1"                "INHA"     ""                "CEP192"
## V178 "BCL6"                "HSPA5"    ""                "BUB1"
## V179 "IRS2"                "NDST2"    ""                "GEMIN4"
## V180 "SLC2A3"              "NEDD4L"   ""                "PLEKHG2"
## V181 "CEBPD"               "TPBG"     ""                "RICTOR"
## V182 "IL23A"               "XPNPEP1"  ""                "BCL2L11"
```

```
## V183 "SMAD3"                "IL6"      ""                    "DYNC1H1"
## V184 "TAP1"                 "SLC6A6"   ""                    "FSCN1"
## V185 "MSC"                  "MAP3K1"   ""                    "ARHGEF7"
## V186 "IFIH1"                "LDHC"     ""                    "DYNLL2"
## V187 "IL15RA"               "AKAP12"   ""                    "MYO1E"
## V188 "TNIP2"                "TES"      ""                    "BIN1"
## V189 "BCL3"                 "KIF5A"    ""                    "NOTCH2"
## V190 "PANX1"                "LALBA"    ""                    "RFC1"
## V191 "FJX1"                 "COL5A1"   ""                    "PDLIM5"
## V192 "EDN1"                 "GPC1"     ""                    "RHOT2"
## V193 "EIF1"                 "HDLBP"    ""                    "SORBS2"
## V194 "BMP2"                 "ILVBL"    ""                    "CDC42EP1"
## V195 "DUSP4"                "NCAN"     ""                    "VCL"
## V196 "PDLIM5"               "TGM2"     ""                    "CLIP1"
## V197 "ICOSLG"               "ETS1"     ""                    "STK38L"
## V198 "GFPT2"                "HOXB9"    ""                    "YWHAE"
## V199 "KLF2"                 "SELENBP1" ""                    "RAPGEF5"
## V200 "TNC"                  "FOSL2"    ""                    "CEP72"
## V201 "SERPINB8"             "SULT2B1"  ""                    "CSNK1D"
## V202 "MXD1"                 "TGFB3"    ""                    ""
##      WNT_BETA_CATENIN_SIGNALING TGF_BETA_SIGNALING IL6_JAK_STAT3_SIGNALING
## V3   "MYC"                      "TGFBR1"           "IL4R"
## V4   "CTNNB1"                   "SMAD7"            "IL6ST"
## V5   "JAG2"                     "TGFB1"            "STAT1"
## V6   "NOTCH1"                   "SMURF2"           "IL1R1"
## V7   "DLL1"                     "SMURF1"           "CSF2RB"
## V8   "AXIN2"                    "BMPR2"            "SOCS3"
## V9   "PSEN2"                    "SKIL"             "STAT3"
## V10  "FZD1"                     "SKI"              "OSMR"
## V11  "NOTCH4"                   "ACVR1"            "IL2RG"
## V12  "LEF1"                     "PMEPA1"           "IFNGR1"
## V13  "AXIN1"                    "NCOR2"            "TYK2"
## V14  "NKD1"                     "SERPINE1"         "IL13RA1"
## V15  "WNT5B"                    "JUNB"             "TLR2"
## V16  "CUL1"                     "SMAD1"            "IFNGR2"
## V17  "JAG1"                     "SMAD6"            "IL10RB"
## V18  "MAML1"                    "PPP1R15A"         "IL6"
## V19  "KAT2A"                    "TGIF1"            "IL1R2"
## V20  "GNAI1"                    "FURIN"            "IL3RA"
## V21  "WNT6"                     "SMAD3"            "IFNAR1"
## V22  "PTCH1"                    "FKBP1A"           "TNFRSF1A"
## V23  "NCOR2"                    "MAP3K7"           "MYD88"
## V24  "DKK4"                     "BMPR1A"           "ACVR1B"
## V25  "HDAC2"                    "CTNNB1"           "CSF3R"
## V26  "DKK1"                     "HIPK2"            "ITGB3"
## V27  "TCF7"                     "KLF10"            "REG1A"
## V28  "WNT1"                     "BMP2"             "CXCL1"
## V29  "NUMB"                     "ENG"              "A2M"
## V30  "ADAM17"                   "APC"              "CSF2RA"
## V31  "DVL2"                     "PPM1A"            "IL15RA"
## V32  "PPARD"                    "XIAP"             "IRF9"
## V33  "NCSTN"                    "CDH1"             "PDGFC"
## V34  "HDAC5"                    "ID1"              "HAX1"
## V35  "CCND2"                    "LEFTY2"           "BAK1"
```

```
## V36  "FRAT1"                "CDKN1C"          "EBI3"
## V37  "CSNK1E"               "TRIM33"          "INHBE"
## V38  "RBPJ"                 "RAB31"           "CRLF2"
## V39  "FZD8"                 "TJP1"            "TNFRSF1B"
## V40  "TP53"                 "SLC20A1"         "CD14"
## V41  "SKP2"                 "CDK9"            "PTPN1"
## V42  "HEY2"                 "ID3"             "PTPN2"
## V43  "HEY1"                 "NOG"             "IL1B"
## V44  "HDAC11"               "ARID4B"          "CSF1"
## V45  ""                     "IFNGR2"          "IL18R1"
## V46  ""                     "ID2"             "TNF"
## V47  ""                     "PPP1CA"          "PF4"
## V48  ""                     "SPTBN1"          "CXCL13"
## V49  ""                     "WWTR1"           "LTBR"
## V50  ""                     "BCAR3"           "FAS"
## V51  ""                     "THBS1"           "IL17RA"
## V52  ""                     "FNTA"            "CXCL10"
## V53  ""                     "HDAC1"           "IL9R"
## V54  ""                     "UBE2D3"          "STAM2"
## V55  ""                     "LTBP2"           "TNFRSF12A"
## V56  ""                     "RHOA"            "STAT2"
## V57  ""                     ""                "HMOX1"
## V58  ""                     ""                "LEPR"
## V59  ""                     ""                "CBL"
## V60  ""                     ""                "CD9"
## V61  ""                     ""                "CXCL3"
## V62  ""                     ""                "TGFB1"
## V63  ""                     ""                "MAP3K8"
## V64  ""                     ""                "ITGA4"
## V65  ""                     ""                "CD38"
## V66  ""                     ""                "JUN"
## V67  ""                     ""                "SOCS1"
## V68  ""                     ""                "ACVRL1"
## V69  ""                     ""                "PIM1"
## V70  ""                     ""                "TNFRSF21"
## V71  ""                     ""                "PIK3R5"
## V72  ""                     ""                "GRB2"
## V73  ""                     ""                "IRF1"
## V74  ""                     ""                "DNTT"
## V75  ""                     ""                "CSF2"
## V76  ""                     ""                "IL2RA"
## V77  ""                     ""                "PTPN11"
## V78  ""                     ""                "IL12RB1"
## V79  ""                     ""                "CCR1"
## V80  ""                     ""                "CNTFR"
## V81  ""                     ""                "PLA2G2A"
## V82  ""                     ""                "CXCL9"
## V83  ""                     ""                "CD44"
## V84  ""                     ""                "IL7"
## V85  ""                     ""                "CXCL11"
## V86  ""                     ""                "CCL7"
## V87  ""                     ""                "LTB"
## V88  ""                     ""                "IL17RB"
## V89  ""                     ""                "CD36"
```

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## V90  ""                    ""                ""
## V91  ""                    ""                ""
## V92  ""                    ""                ""
## V93  ""                    ""                ""
## V94  ""                    ""                ""
## V95  ""                    ""                ""
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## V139 ""                    ""                ""
## V140 ""                    ""                ""
## V141 ""                    ""                ""
## V142 ""                    ""                ""
## V143 ""                    ""                ""
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## V144 ""                    ""              ""
## V145 ""                    ""              ""
## V146 ""                    ""              ""
## V147 ""                    ""              ""
## V148 ""                    ""              ""
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## V193 ""                    ""              ""
## V194 ""                    ""              ""
## V195 ""                    ""              ""
## V196 ""                    ""              ""
## V197 ""                    ""              ""
```

```
## V198 ""                         ""                ""
## V199 ""                         ""                ""
## V200 ""                         ""                ""
## V201 ""                         ""                ""
## V202 ""                         ""                ""
##      DNA_REPAIR G2M_CHECKPOINT APOPTOSIS   NOTCH_SIGNALING ADIPOGENESIS
## V3   "POLR2H"   "AURKA"        "CASP3"     "JAG1"          "FABP4"
## V4   "POLR2A"   "CCNA2"        "CASP9"     "NOTCH3"        "ADIPOQ"
## V5   "POLR2G"   "TOP2A"        "DFFA"      "NOTCH2"        "PPARG"
## V6   "POLR2E"   "CCNB2"        "CASP7"     "APH1A"         "LIPE"
## V7   "POLR2J"   "CENPA"        "CFLAR"     "HES1"          "DGAT1"
## V8   "POLR2F"   "BIRC5"        "BIRC3"     "CCND1"         "LPL"
## V9   "POLR2C"   "CDC20"        "PMAIP1"    "FZD1"          "CPT2"
## V10  "POLR2K"   "PLK1"         "CASP8"     "PSEN2"         "CD36"
## V11  "GTF2H3"   "TTK"          "JUN"       "FZD7"          "GPAM"
## V12  "POLR2D"   "PRC1"         "BCL2L11"   "DTX1"          "ADIPOR2"
## V13  "ERCC3"    "NDC80"        "MCL1"      "DLL1"          "ACAA2"
## V14  "DDB2"     "KIF11"        "IL1B"      "FZD5"          "ETFB"
## V15  "POLR1C"   "NUSAP1"       "SPTAN1"    "MAML2"         "ACOX1"
## V16  "XPC"      "CKS2"         "DIABLO"    "NOTCH1"        "ACADM"
## V17  "PCNA"     "KIF2C"        "BAX"       "PSENEN"        "HADH"
## V18  "POLR2I"   "MKI67"        "BIK"       "WNT5A"         "IDH1"
## V19  "SUPT4H1"  "AURKB"        "IL1A"      "CUL1"          "SORBS1"
## V20  "POLD3"    "TPX2"         "BID"       "WNT2"          "ACADS"
## V21  "POLR3GL"  "SMC4"         "CDKN1A"    "DTX4"          "UCK1"
## V22  "POLR3C"   "BUB1"         "GADD45A"   "SAP30"         "SCP2"
## V23  "GTF2B"    "CENPF"        "DDIT3"     "PPARD"         "DECR1"
## V24  "POLR1D"   "RACGAP1"      "CDKN1B"    "KAT2A"         "CDKN2C"
## V25  "NCBP2"    "CENPE"        "TNF"       "HEYL"          "TALDO1"
## V26  "NELFE"    "KIF23"        "GSN"       "SKP1"          "TST"
## V27  "GTF2F1"   "UBE2C"        "TNFSF10"   "RBX1"          "MCCC1"
## V28  "ERCC5"    "MCM6"         "CASP6"     "TCF7L2"        "PGM1"
## V29  "LIG1"     "MCM3"         "SQSTM1"    "ARRB1"         "REEP5"
## V30  "ERCC1"    "PTTG1"        "FASLG"     "LFNG"          "BCL2L13"
## V31  "ERCC4"    "CDK1"         "EGR3"      "PRKCA"         "SLC25A10"
## V32  "POLD4"    "KIF4A"        "CD44"      "DTX2"          "ME1"
## V33  "NELFB"    "ESPL1"        "FAS"       "ST3GAL6"       "PHYH"
## V34  "RFC2"     "MAD2L1"       "IL18"      "FBXW11"        "PIM3"
## V35  "ELL"      "NEK2"         "IGFBP6"    ""              "YWHAG"
## V36  "TAF10"    "KIF22"        "PRF1"      ""              "NDUFAB1"
## V37  "RRM2B"    "HMMR"         "DAP"       ""              "GPD2"
## V38  "SUPT5H"   "KPNA2"        "CCND1"     ""              "ADIG"
## V39  "RPA3"     "CDKN3"        "BTG3"      ""              "ECHS1"
## V40  "SNAPC5"   "CDC25A"       "F2R"       ""              "QDPR"
## V41  "SSRP1"    "H2AX"         "SATB1"     ""              "CS"
## V42  "RFC3"     "CDC25B"       "BNIP3L"    ""              "ECH1"
## V43  "RPA2"     "PLK4"         "CASP4"     ""              "SLC25A1"
## V44  "ELOA"     "CDC6"         "TNFRSF12A" ""              "ACADL"
## V45  "TAF12"    "CCNF"         "CREBBP"    ""              "TOB1"
## V46  "NELFCD"   "MCM5"         "RHOB"      ""              "GRPEL1"
## V47  "TAF13"    "LMNB1"        "GPX3"      ""              "CRAT"
## V48  "TAF6"     "E2F3"         "PDGFRB"    ""              "GBE1"
## V49  "TAF9"     "KIF15"        "TSPO"      ""              "CAVIN2"
## V50  "GTF2A2"   "CHEK1"        "CCND2"     ""              "SCARB1"
```

```
## V51  "VPS37D"   "UBE2S"       "XIAP"      ""            "PEMT"
## V52  "NME1"     "NSD2"        "TIMP1"     ""            "CHCHD10"
## V53  "RNMT"     "HMGB3"       "CTNNB1"    ""            "AK2"
## V54  "ERCC2"    "DBF4"        "IRF1"      ""            "APOE"
## V55  "POLE4"    "TACC3"       "HSPB1"     ""            "UQCR10"
## V56  "VPS37B"   "MCM2"        "ADD1"      ""            "TANK"
## V57  "NT5C3A"   "CDKN2C"      "TIMP2"     ""            "ANGPTL4"
## V58  "SNAPC4"   "CDKN1B"      "BTG2"      ""            "ACO2"
## V59  "AAAS"     "FANCC"       "TIMP3"     ""            "FAH"
## V60  "ZNRD1"    "NASP"        "LEF1"      ""            "ACLY"
## V61  "RFC4"     "STAG1"       "CASP1"     ""            "IFNGR1"
## V62  "ITPA"     "GINS2"       "GPX1"      ""            "SLC5A6"
## V63  "POM121"   "FBXO5"       "BCL10"     ""            "JAGN1"
## V64  "BRF2"     "POLQ"        "IGF2R"     ""            "EPHX2"
## V65  "RFC5"     "EZH2"        "CDC25B"    ""            "IDH3G"
## V66  "SAC3D1"   "RAD21"       "AIFM3"     ""            "GPX3"
## V67  "CLP1"     "STMN1"       "CD38"      ""            "ELMOD3"
## V68  "NME4"     "SUV39H1"     "PPP3R1"    ""            "ORM1"
## V69  "PRIM1"    "PRIM2"       "HGF"       ""            "RETSAT"
## V70  "VPS28"    "E2F1"        "CLU"       ""            "ESRRA"
## V71  "TSG101"   "CHAF1A"      "ATF3"      ""            "HIBCH"
## V72  "USP11"    "NOLC1"       "LGALS3"    ""            "SUCLG1"
## V73  "TAF1C"    "GSPT1"       "LUM"       ""            "STAT5A"
## V74  "TARBP2"   "BUB3"        "LMNA"      ""            "ITGA7"
## V75  "POLH"     "SMC1A"       "GADD45B"   ""            "MRAP"
## V76  "CETN2"    "ILF3"        "CDK2"      ""            "PLIN2"
## V77  "POLD1"    "CDC7"        "IFNB1"     ""            "CYC1"
## V78  "CANT1"    "INCENP"      "RETSAT"    ""            "ALDH2"
## V79  "PDE4B"    "CKS1B"       "SMAD7"     ""            "RNF11"
## V80  "DGCR8"    "EXO1"        "SOD1"      ""            "ALDOA"
## V81  "RAD51"    "H2AZ1"       "PTK2"      ""            "SULT1A1"
## V82  "SURF1"    "TFDP1"       "ENO2"      ""            "DDT"
## V83  "PNP"      "CCND1"       "HMOX1"     ""            "SDHB"
## V84  "ADA"      "KPNB1"       "IER3"      ""            "CD151"
## V85  "NME3"     "JPT1"        "BCL2L10"   ""            "SLC27A1"
## V86  "GTF3C5"   "LBR"         "CD2"       ""            "BCKDHA"
## V87  "NT5C"     "HUS1"        "GCH1"      ""            "C3"
## V88  "AK1"      "KIF20B"      "MMP2"      ""            "LEP"
## V89  "GTF2H1"   "TOP1"        "VDAC2"     ""            "ADCY6"
## V90  "HCLS1"    "PDS5B"       "TAP1"      ""            "ELOVL6"
## V91  "APRT"     "SRSF1"       "PLAT"      ""            "LTC4S"
## V92  "ERCC8"    "STIL"        "IFNGR1"    ""            "SPARCL1"
## V93  "IMPDH2"   "ABL1"        "APP"       ""            "RMDN3"
## V94  "POLB"     "DTYMK"       "BRCA1"     ""            "MTCH2"
## V95  "SDCBP"    "CDC27"       "ROCK1"     ""            "SOWAHC"
## V96  "SF3A3"    "BARD1"       "PSEN1"     ""            "SLC1A5"
## V97  "DAD1"     "ATF5"        "DCN"       ""            "CMPK1"
## V98  "UPF3B"    "CDC45"       "PSEN2"     ""            "REEP6"
## V99  "GUK1"     "ODC1"        "SOD2"      ""            "NDUFA5"
## V100 "TP53"     "XPO1"        "BMF"       ""            "FZD4"
## V101 "ADRM1"    "SFPQ"        "EREG"      ""            "DRAM2"
## V102 "SEC61A1"  "TMPO"        "KRT18"     ""            "MGST3"
## V103 "POLA2"    "PML"         "TGFB2"     ""            "ATP1B3"
## V104 "FEN1"     "BRCA2"       "RELA"      ""            "RETN"
```

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## V105 "ZNF707"   "CTCF"        "WEE1"      ""            "STOM"
## V106 "NUDT9"    "KNL1"        "RARA"      ""            "ESYT1"
## V107 "PDE6G"    "KMT5A"       "CD14"      ""            "GHITM"
## V108 "TYMS"     "SLC38A1"     "CD69"      ""            "DNAJC15"
## V109 "BCAP31"   "TRA2B"       "PEA15"     ""            "GADD45A"
## V110 "DDB1"     "MYBL2"       "DNAJC3"    ""            "VEGFB"
## V111 "NFX1"     "TROAP"       "CASP2"     ""            "PFKL"
## V112 "RAD52"    "TENT4A"      "CTH"       ""            "COQ3"
## V113 "ADCY6"    "CUL3"        "PLCB2"     ""            "NABP1"
## V114 "ARL6IP1"  "MAPK14"      "BMP2"      ""            "CYP4B1"
## V115 "DGUOK"    "H2BC12"      "HMGB2"     ""            "PPM1B"
## V116 "POLL"     "MYC"         "PLPPR4"    ""            "ARAF"
## V117 "SMAD5"    "AMD1"        "H1-0"      ""            "CAVIN1"
## V118 "MPG"      "CBX1"        "TGFBR3"    ""            "COL4A1"
## V119 "DUT"      "CHMP1A"      "EBP"       ""            "IMMT"
## V120 "POLA1"    "DKC1"        "TXNIP"     ""            "DHRS7"
## V121 "AGO4"     "YTHDC1"      "ANKH"      ""            "COL15A1"
## V122 "RALA"     "CCNT1"       "RHOT2"     ""            "NMT1"
## V123 "ZWINT"    "TGFB1"       "CYLD"      ""            "COQ5"
## V124 "BCAM"     "ATRX"        "GSTM1"     ""            "LAMA4"
## V125 "TK2"      "LIG3"        "GSR"       ""            "AGPAT3"
## V126 "CSTF3"    "NUP50"       "BGN"       ""            "BAZ2A"
## V127 "GTF2H5"   "SLC7A5"      "BCL2L1"    ""            "IDH3A"
## V128 "HPRT1"    "RBL1"        "GNA15"     ""            "LIFR"
## V129 "BOLA2"    "NUMA1"       "MGMT"      ""            "PREB"
## V130 "GPX4"     "RAD54L"      "PPT1"      ""            "PTGER3"
## V131 "MPC2"     "EFNA5"       "F2"        ""            "GPHN"
## V132 "CDA"      "PRPF4B"      "IL6"       ""            "PFKFB3"
## V133 "ALYREF"   "UCK2"        "SC5D"      ""            "GPX4"
## V134 "MRPL40"   "ARID4A"      "IFITM3"    ""            "SSPN"
## V135 "NPR2"     "CUL1"        "RNASEL"    ""            "SQOR"
## V136 "REV3L"    "UPF1"        "EMP1"      ""            "MTARC2"
## V137 "EDF1"     "DR1"         "CAV1"      ""            "DLD"
## V138 "GSDME"    "MNAT1"       "DNM1L"     ""            "ITIH5"
## V139 "TMED2"    "SMC2"        "ANXA1"     ""            "CD302"
## V140 "STX3"     "RBM14"       "TOP2A"     ""            "ATL2"
## V141 "RAE1"     "RPA2"        "ISG20"     ""            "GPAT4"
## V142 "UMPS"     "SQLE"        "SLC20A1"   ""            "LPCAT3"
## V143 "EIF1B"    "ORC6"        "MADD"      ""            "TKT"
## V144 "AK3"      "CDK4"        "PPP2R5B"   ""            "UQCRC1"
## V145 "NUDT21"   "POLE"        "BCAP31"    ""            "CAT"
## V146 "RBX1"     "RASAL2"      "ERBB3"     ""            "OMD"
## V147 "SRSF6"    "HOXC10"      "NEDD9"     ""            "DLAT"
## V148 "GMPR2"    "RPS6KA5"     "SAT1"      ""            "MRPL15"
## V149 "DCTN4"    "CUL4A"       "PDCD4"     ""            "RIOK3"
## V150 "COX17"    "SLC7A1"      "BCL2L2"    ""            "RTN3"
## V151 "CMPK2"    "FOXN3"       "FEZ1"      ""            "CHUK"
## V152 "CCNO"     "HMGA1"       "ERBB2"     ""            "G3BP2"
## V153 ""         "SS18"        "DNAJA1"    ""            "SDHC"
## V154 ""         "TRAIP"       "DAP3"      ""            "SAMM50"
## V155 ""         "PRMT5"       "DPYD"      ""            "ARL4A"
## V156 ""         "CUL5"        "NEFH"      ""            "SNCG"
## V157 ""         "DDX39A"      "PAK1"      ""            "PDCD4"
## V158 ""         "MARCKS"      "FDXR"      ""            "COQ9"
```

```
## V159 ""         "PBK"          "GPX4"      ""              "APLP2"
## V160 ""         "ORC5"         "ETF1"      ""              "SOD1"
## V161 ""         "SAP30"        "CCNA1"     ""              "PTCD3"
## V162 ""         "KATNA1"       "GUCY2D"    ""              "PHLDB1"
## V163 ""         "HNRNPD"       "AVPR1A"    ""              "ENPP2"
## V164 ""         "POLA2"        ""          ""              "HSPB8"
## V165 ""         "HIRA"         ""          ""              "AIFM1"
## V166 ""         "HIF1A"        ""          ""              "CCNG2"
## V167 ""         "SYNCRIP"      ""          ""              "PPP1R15B"
## V168 ""         "TLE3"         ""          ""              "MDH2"
## V169 ""         "NCL"          ""          ""              "ABCA1"
## V170 ""         "RAD23B"       ""          ""              "COX7B"
## V171 ""         "E2F2"         ""          ""              "MYLK"
## V172 ""         "EGF"          ""          ""              "COX8A"
## V173 ""         "HMGN2"        ""          ""              "DHRS7B"
## V174 ""         "SRSF10"       ""          ""              "MIGA2"
## V175 ""         "SNRPD1"       ""          ""              "MGLL"
## V176 ""         "CASP8AP2"     ""          ""              "ITSN1"
## V177 ""         "SMARCC1"      ""          ""              "DHCR7"
## V178 ""         "SLC12A2"      ""          ""              "RREB1"
## V179 ""         "NOTCH2"       ""          ""              "CMBL"
## V180 ""         "TNPO2"        ""          ""              "UBC"
## V181 ""         "SMAD3"        ""          ""              "ATP5PO"
## V182 ""         "MAP3K20"      ""          ""              "PRDX3"
## V183 ""         "HSPA8"        ""          ""              "DBT"
## V184 ""         "G3BP1"        ""          ""              "NDUFS3"
## V185 ""         "PTTG3P"       ""          ""              "NKIRAS1"
## V186 ""         "DMD"          ""          ""              "RAB34"
## V187 ""         "MEIS1"        ""          ""              "CIDEA"
## V188 ""         "HNRNPU"       ""          ""              "UQCRQ"
## V189 ""         "SRSF2"        ""          ""              "PEX14"
## V190 ""         "MT2A"         ""          ""              "BCL6"
## V191 ""         "NUP98"        ""          ""              "COX6A1"
## V192 ""         "EWSR1"        ""          ""              "DNAJB9"
## V193 ""         "KIF5B"        ""          ""              "MAP4K3"
## V194 ""         "MTF2"         ""          ""              "ANGPT1"
## V195 ""         "E2F4"         ""          ""              "UBQLN1"
## V196 ""         "BCL3"         ""          ""              "NDUFB7"
## V197 ""         "PURA"         ""          ""              "SLC19A1"
## V198 ""         "MEIS2"        ""          ""              "ABCB8"
## V199 ""         "PAFAH1B1"     ""          ""              "SLC66A3"
## V200 ""         "WRN"          ""          ""              "POR"
## V201 ""         "H2AZ2"        ""          ""              "UCP2"
## V202 ""         "ODF2"         ""          ""              "UQCR11"
##      ESTROGEN_RESPONSE_EARLY ESTROGEN_RESPONSE_LATE ANDROGEN_RESPONSE
## V3   "GREB1"                 "TFF1"                 "KLK3"
## V4   "CA12"                  "SLC9A3R1"             "KLK2"
## V5   "SLC9A3R1"              "TPD52L1"              "ACSL3"
## V6   "MYB"                   "PRSS23"               "PIAS1"
## V7   "ANXA9"                 "CA12"                 "CAMKK2"
## V8   "IGFBP4"                "PDZK1"                "NKX3-1"
## V9   "SYBU"                  "ANXA9"                "TMPRSS2"
## V10  "NPY1R"                 "CELSR2"               "APPBP2"
## V11  "PDZK1"                 "TJP3"                 "CENPN"
```

```
## V12  "NRIP1"              "PGR"              "BMPR1B"
## V13  "MLPH"               "RET"              "MAF"
## V14  "HSPB8"              "MYB"              "FADS1"
## V15  "EGR3"               "TPBG"             "ZBTB10"
## V16  "KRT19"              "EGR3"             "HMGCR"
## V17  "LRIG1"              "ARL3"             "SPCS3"
## V18  "KDM4B"              "OLFM1"            "INSIG1"
## V19  "PGR"                "NPY1R"            "NGLY1"
## V20  "RHOBTB3"            "SCNN1A"           "UBE2J1"
## V21  "TPD52L1"            "XBP1"             "ELK4"
## V22  "ELOVL2"             "AREG"             "ABCC4"
## V23  "RET"                "IL17RB"           "ELOVL5"
## V24  "TPBG"               "NRIP1"            "ALDH1A3"
## V25  "TFF1"               "ASS1"             "AZGP1"
## V26  "MAPT"               "TFF3"             "ABHD2"
## V27  "SCNN1A"             "FKBP4"            "SAT1"
## V28  "ABAT"               "SLC27A2"          "DBI"
## V29  "FLNB"               "SEMA3B"           "DHCR24"
## V30  "XBP1"               "GPER1"            "SORD"
## V31  "CELSR2"             "LLGL2"            "STK39"
## V32  "RAB31"              "AGR2"             "TPD52"
## V33  "MYBL1"              "KRT19"            "IDI1"
## V34  "MREG"               "CCN5"             "B2M"
## V35  "FAM102A"            "BLVRB"            "MAP7"
## V36  "MSMB"               "FLNB"             "DNAJB9"
## V37  "STC2"               "PDCD4"            "FKBP5"
## V38  "RETREG1"            "CALCR"            "HERC3"
## V39  "SIAH2"              "IGFBP4"           "PGM3"
## V40  "ZNF185"             "DNAJC12"          "HOMER2"
## V41  "SLC19A2"            "TIAM1"            "ELL2"
## V42  "SLC1A4"             "TSPAN13"          "UAP1"
## V43  "FHL2"               "CXCL12"           "SEC24D"
## V44  "BCL2"               "RAB31"            "LMAN1"
## V45  "PMAIP1"             "PKP3"             "PMEPA1"
## V46  "AREG"               "CYP26B1"          "INPP4B"
## V47  "OVOL2"              "FKBP5"            "RRP12"
## V48  "TSKU"               "SIAH2"            "SELENOP"
## V49  "ADCY9"              "ISG20"            "NDRG1"
## V50  "RASGRP1"            "TMPRSS3"          "KRT19"
## V51  "MUC1"               "SERPINA3"         "ITGAV"
## V52  "KAZN"               "WFS1"             "B4GALT1"
## V53  "SLC27A2"            "MAPT"             "MAK"
## V54  "FKBP4"              "PDLIM3"           "SPDEF"
## V55  "CXCL12"             "RBBP8"            "GSR"
## V56  "TMPRSS3"            "GJB3"             "KRT8"
## V57  "RARA"               "PRLR"             "LIFR"
## V58  "IL17RB"             "SLC1A4"           "PLPP1"
## V59  "CBFA2T3"            "FOS"              "STEAP4"
## V60  "TFF3"               "PLAAT3"           "GUCY1A1"
## V61  "UGCG"               "SLC7A5"           "SRP19"
## V62  "CCND1"              "SERPINA5"         "CCND3"
## V63  "SLC22A5"            "IMPA2"            "IQGAP2"
## V64  "WFS1"               "DHCR7"            "RAB4A"
## V65  "PTGES"              "MYOF"             "SLC26A2"
```

```
## V66  "WWC1"          "CDH1"          "SMS"
## V67  "CCN5"          "EMP2"          "ZMIZ1"
## V68  "MYC"           "OVOL2"         "SGK1"
## V69  "ITPK1"         "DLG5"          "MERTK"
## V70  "TMEM164"       "SOX3"          "HPGD"
## V71  "ARL3"          "CHPT1"         "ANKH"
## V72  "MED13L"        "KLK10"         "GNAI3"
## V73  "SEMA3B"        "ELOVL5"        "SRF"
## V74  "KRT18"         "RAPGEFL1"      "SLC38A2"
## V75  "SLC16A1"       "JAK2"          "HMGCS1"
## V76  "TJP3"          "SLC26A2"       "ARID5B"
## V77  "SLC26A2"       "SLC22A5"       "CDC14B"
## V78  "FCMR"          "ITPK1"         "TNFAIP8"
## V79  "SULT2B1"       "PCP4"          "XRCC5"
## V80  "SNX24"         "PAPSS2"        "GPD1L"
## V81  "TFAP2C"        "NAB2"          "ACTN1"
## V82  "TTC39A"        "FAM102A"       "RPS6KA3"
## V83  "GJA1"          "BCL2"          "TSC22D1"
## V84  "PRSS23"        "LSR"           "PDLIM5"
## V85  "OLFM1"         "CACNA2D2"      "TMEM50A"
## V86  "RAPGEFL1"      "CA2"           "ADAMTS1"
## V87  "ASB13"         "ASCL1"         "NCOA4"
## V88  "TIPARP"        "ACOX2"         "AKAP12"
## V89  "ABCA3"         "CISH"          "SCD"
## V90  "FRK"           "GLA"           "PTK2B"
## V91  "DHRS2"         "PTGES"         "CDK6"
## V92  "AQP3"          "PERP"          "ADRM1"
## V93  "KCNK15"        "OPN3"          "H1-0"
## V94  "TGIF2"         "KRT13"         "HSD17B14"
## V95  "FOXC1"         "HSPB8"         "VAPA"
## V96  "ELF3"          "UGDH"          "CCND1"
## V97  "REEP1"         "CLIC3"         "XRCC6"
## V98  "PEX11A"        "KLK11"         "MYL12A"
## V99  "PODXL"         "PLAC1"         "UBE2I"
## V100 "KLF4"          "ABHD2"         "PTPN21"
## V101 "BAG1"          "SCARB1"        "AKT1"
## V102 "CELSR1"        "DCXR"          "PA2G4"
## V103 "PLAAT3"        "CCND1"         ""
## V104 "SLC7A5"        "SFN"           ""
## V105 "MPPED2"        "ABCA3"         ""
## V106 "TIAM1"         "SULT2B1"       ""
## V107 "CLDN7"         "CCNA1"         ""
## V108 "MYOF"          "STIL"          ""
## V109 "RBBP8"         "MICB"          ""
## V110 "OLFML3"        "ZFP36"         ""
## V111 "GFRA1"         "CAV1"          ""
## V112 "FARP1"         "NBL1"          ""
## V113 "SVIL"          "CD44"          ""
## V114 "TGM2"          "HR"            ""
## V115 "DEPTOR"        "HOMER2"        ""
## V116 "CYP26B1"       "BTG3"          ""
## V117 "PAPSS2"        "GAL"           ""
## V118 "SLC1A1"        "ETFB"          ""
## V119 "DLC1"          "BAG1"          ""
```

```
## V120 "JAK2"                "FRK"                ""
## V121 "AFF1"                "SLC16A1"            ""
## V122 "KLK10"               "AFF1"               ""
## V123 "P2RY2"               "TFAP2C"             ""
## V124 "BLVRB"               "IGSF1"              ""
## V125 "CISH"                "HPRT1"              ""
## V126 "GLA"                 "CDC6"               ""
## V127 "ADD3"                "FARP1"              ""
## V128 "PDLIM3"              "AMFR"               ""
## V129 "MINDY1"              "DHRS2"              ""
## V130 "FOS"                 "NXT1"               ""
## V131 "KRT8"                "S100A9"             ""
## V132 "SLC37A1"             "SLC29A1"            ""
## V133 "B4GALT1"             "SLC24A3"            ""
## V134 "CALCR"               "FOXC1"              ""
## V135 "ESRP2"               "KIF20A"             ""
## V136 "IGF1R"               "TOB1"               ""
## V137 "NBL1"                "FDFT1"              ""
## V138 "SFN"                 "DNAJC1"             ""
## V139 "OPN3"                "TPSAB1"             ""
## V140 "ABHD2"               "TSTA3"              ""
## V141 "AR"                  "FGFR3"              ""
## V142 "SLC39A6"             "SGK1"               ""
## V143 "SYT12"               "ID2"                ""
## V144 "CD44"                "GALE"               ""
## V145 "MED24"               "BATF"               ""
## V146 "BCL11B"              "MAPK13"             ""
## V147 "CANT1"               "FABP5"              ""
## V148 "KRT13"               "MEST"               ""
## V149 "KRT15"               "JAK1"               ""
## V150 "TOB1"                "CYP4F11"            ""
## V151 "SLC7A2"              "KCNK5"              ""
## V152 "LAD1"                "CPE"                ""
## V153 "TUBB2B"              "XRCC3"              ""
## V154 "TBC1D30"             "CXCL14"             ""
## V155 "SEC14L2"             "SCUBE2"             ""
## V156 "ENDOD1"              "CDC20"              ""
## V157 "HR"                  "IL6ST"              ""
## V158 "SCARB1"              "GINS2"              ""
## V159 "NCOR2"               "TRIM29"             ""
## V160 "RHOD"                "UNC13B"             ""
## V161 "INPP5F"              "LAMC2"              ""
## V162 "PPIF"                "LARGE1"             ""
## V163 "DHRS3"               "SLC2A8"             ""
## V164 "FDFT1"               "PLXNB1"             ""
## V165 "GAB2"                "PRKAR2B"            ""
## V166 "UNC119"              "RPS6KA2"            ""
## V167 "KLF10"               "HSPA4L"             ""
## V168 "HES1"                "TFPI2"              ""
## V169 "FKBP5"               "SERPINA1"           ""
## V170 "SLC2A1"              "TNNC1"              ""
## V171 "AMFR"                "HMGCS2"             ""
## V172 "NADSYN1"             "ALDH3A2"            ""
## V173 "INHBB"               "CD9"                ""
```

```
## V174 "BHLHE40"              "IDH2"                ""
## V175 "CALB2"                "SORD"                ""
## V176 "FASN"                 "MDK"                 ""
## V177 "CHPT1"                "ALDH3B1"             ""
## V178 "MYBBP1A"              "PTGER3"              ""
## V179 "ELOVL5"               "RABEP1"              ""
## V180 "DYNLT3"               "KLF4"                ""
## V181 "ABLIM1"               "PPIF"                ""
## V182 "SOX3"                 "SNX10"               ""
## V183 "SLC24A3"              "METTL3"              ""
## V184 "RAB17"                "PLK4"                ""
## V185 "MAST4"                "COX6C"               ""
## V186 "KCNK5"                "ST14"                ""
## V187 "ELF1"                 "NCOR2"               ""
## V188 "RPS6KA2"              "MOCS2"               ""
## V189 "ISG20L2"              "NMU"                 ""
## V190 "IL6ST"                "TH"                  ""
## V191 "SYNGR1"               "RNASEH2A"            ""
## V192 "SH3BP5"               "CHST8"               ""
## V193 "ALDH3B1"              "TST"                 ""
## V194 "THSD4"                "TOP2A"               ""
## V195 "CLIC3"                "CKB"                 ""
## V196 "NXT1"                 "LTF"                 ""
## V197 "NAV2"                 "DUSP2"               ""
## V198 "RRP12"                "PTPN6"               ""
## V199 "ADCY1"                "ATP2B4"              ""
## V200 "DHCR7"                "ST6GALNAC2"          ""
## V201 "MICB"                 "ADD3"                ""
## V202 "AKAP1"                "DYNLT3"              ""
##      MYOGENESIS  PROTEIN_SECRETION INTERFERON_ALPHA_RESPONSE
## V3   "ACTA1"     "ARCN1"           "MX1"
## V4   "TNNI2"     "TMED10"          "ISG15"
## V5   "MYL1"      "COPB2"           "OAS1"
## V6   "TNNC1"     "RAB14"           "IFIT3"
## V7   "TNNC2"     "ATP7A"           "IFI44"
## V8   "MYH3"      "COPB1"           "IFI35"
## V9   "MYLPF"     "LAMP2"           "IRF7"
## V10  "TNNT3"     "EGFR"            "RSAD2"
## V11  "TNNT2"     "IGF2R"           "IFI44L"
## V12  "CASQ2"     "COPE"            "IFITM1"
## V13  "ACTC1"     "PPT1"            "IFI27"
## V14  "MYOM1"     "AP3S1"           "IRF9"
## V15  "MYL4"      "BET1"            "OASL"
## V16  "MYBPH"     "CLCN3"           "EIF2AK2"
## V17  "MYH7"      "AP2S1"           "IFIT2"
## V18  "MYH8"      "CLTC"            "CXCL10"
## V19  "ACTN2"     "AP2M1"           "TAP1"
## V20  "TNNI1"     "RER1"            "SP110"
## V21  "CRYAB"     "KIF1B"           "DDX60"
## V22  "SGCG"      "ARF1"            "UBE2L6"
## V23  "HRC"       "OCRL"            "USP18"
## V24  "TNNT1"     "ICA1"            "PSMB8"
## V25  "DES"       "MON2"            "IFIH1"
## V26  "MYOZ1"     "ARFGEF2"         "BST2"
```

```
## V27  "RYR1"      "TMED2"          "LGALS3BP"
## V28  "CSRP3"     "NAPG"           "ADAR"
## V29  "ADAM12"    "TMX1"           "ISG20"
## V30  "ATP2A1"    "PAM"            "GBP2"
## V31  "CKM"       "SCAMP1"         "IRF1"
## V32  "SVIL"      "SH3GL2"         "PLSCR1"
## V33  "MYOM2"     "RAB2A"          "PSMB9"
## V34  "MYL6B"     "COG2"           "HERC6"
## V35  "TPM2"      "VAMP3"          "SAMD9"
## V36  "MYL2"      "ERGIC3"         "CMPK2"
## V37  "CKMT2"     "DOP1A"          "IFITM3"
## V38  "BIN1"      "VAMP4"          "RTP4"
## V39  "MYH1"      "VPS4B"          "STAT2"
## V40  "ENO3"      "NAPA"           "SAMD9L"
## V41  "FLII"      "GNAS"           "LY6E"
## V42  "FXYD1"     "STX7"           "IFITM2"
## V43  "TPM3"      "SEC22B"         "HELZ2"
## V44  "DMD"       "VPS45"          "CXCL11"
## V45  "IGFBP3"    "STX16"          "TRIM21"
## V46  "CHRNB1"    "YKT6"           "PARP14"
## V47  "SPEG"      "SNX2"           "TRIM26"
## V48  "FHL1"      "ARFGEF1"        "PARP12"
## V49  "ACTN3"     "CLTA"           "NMI"
## V50  "TCAP"      "CLN5"           "RNF31"
## V51  "MYLK"      "M6PR"           "HLA-C"
## V52  "MYL3"      "SGMS1"          "CASP1"
## V53  "PYGM"      "USO1"           "TRIM14"
## V54  "LDB3"      "TSG101"         "TDRD7"
## V55  "COX6A2"    "DNM1L"          "DHX58"
## V56  "FABP3"     "LMAN1"          "PARP9"
## V57  "MYL7"      "YIPF6"          "PNPT1"
## V58  "ITGB5"     "ARFIP1"         "TRIM25"
## V59  "CHRNA1"    "ANP32E"         "PSME1"
## V60  "SSPN"      "TSPAN8"         "WARS1"
## V61  "COL3A1"    "DST"            "EPSTI1"
## V62  "KCNH1"     "SCRN1"          "UBA7"
## V63  "GJA5"      "SEC31A"         "PSME2"
## V64  "MYF6"      "VAMP7"          "B2M"
## V65  "MYH2"      "SCAMP3"         "TRIM5"
## V66  "MAPK12"    "AP2B1"          "C1S"
## V67  "PGAM2"     "RAB22A"         "LAP3"
## V68  "MYOG"      "AP3B1"          "LAMP3"
## V69  "MYH4"      "TPD52"          "GBP4"
## V70  "AEBP1"     "ATP6V1H"        "NCOA7"
## V71  "HBEGF"     "GBF1"           "TMEM140"
## V72  "MEF2C"     "KRT18"          "CD74"
## V73  "NOS1"      "CAV2"           "GMPR"
## V74  "CNN3"      "ATP1A1"         "PSMA3"
## V75  "IGFBP7"    "BNIP3"          "PROCR"
## V76  "CACNA1H"   "ZW10"           "IL7"
## V77  "GSN"       "GALC"           "IFI30"
## V78  "CACNG1"    "ADAM10"         "IRF2"
## V79  "PPFIA4"    "RAB5A"          "CSF1"
## V80  "MB"        "GOLGA4"         "IL15"
```

```
## V81  "SPHK1"     "SEC24D"          "CNP"
## V82  "SCHIP1"    "AP1G1"           "TENT5A"
## V83  "MEF2D"     "MAPK1"           "IL4R"
## V84  "SMTN"      "GOSR2"           "CMTR1"
## V85  "CDKN1A"    "RPS6KA3"         "CD47"
## V86  "GAA"       "STAM"            "LPAR6"
## V87  "TPD52L1"   "ABCA1"           "MOV10"
## V88  "HSPB2"     "SNAP23"          "CASP8"
## V89  "SGCA"      "SOD1"            "TXNIP"
## V90  "BDKRB2"    "GLA"             "SLC25A28"
## V91  "COX7A1"    "ATP6V1B1"        "SELL"
## V92  "COL4A2"    "STX12"           "TRAFD1"
## V93  "PLXNB2"    "CD63"            "BATF2"
## V94  "CTF1"      "TOM1L1"          "RIPK2"
## V95  "COL15A1"   "SSPN"            "CCRL2"
## V96  "KCNH2"     "ARFGAP3"         "NUB1"
## V97  "AGRN"      "RAB9A"           "OGFR"
## V98  "MYO1C"     "CTSC"            "MVB12A"
## V99  "SIRT2"     ""                "ELF1"
## V100 "SGCD"      ""                ""
## V101 "SORBS1"    ""                ""
## V102 "VIPR1"     ""                ""
## V103 "FGF2"      ""                ""
## V104 "FKBP1B"    ""                ""
## V105 "TEAD4"     ""                ""
## V106 "CASQ1"     ""                ""
## V107 "KLF5"      ""                ""
## V108 "PDLIM7"    ""                ""
## V109 "AK1"       ""                ""
## V110 "TAGLN"     ""                ""
## V111 "RIT1"      ""                ""
## V112 "MEF2A"     ""                ""
## V113 "ANKRD2"    ""                ""
## V114 "AKT2"      ""                ""
## V115 "LAMA2"     ""                ""
## V116 "DENND2B"   ""                ""
## V117 "IFRD1"     ""                ""
## V118 "NCAM1"     ""                ""
## V119 "SYNGR2"    ""                ""
## V120 "PICK1"     ""                ""
## V121 "COL6A3"    ""                ""
## V122 "CRAT"      ""                ""
## V123 "DMPK"      ""                ""
## V124 "MYH11"     ""                ""
## V125 "MYH9"      ""                ""
## V126 "IGF1"      ""                ""
## V127 "CKB"       ""                ""
## V128 "FST"       ""                ""
## V129 "GPX3"      ""                ""
## V130 "PVALB"     ""                ""
## V131 "PTP4A3"    ""                ""
## V132 "ITGB1"     ""                ""
## V133 "HSPB8"     ""                ""
## V134 "ACHE"      ""                ""
```

```
## V135 "CHRNG"     ""              ""
## V136 "PKIA"      ""              ""
## V137 "NAV2"      ""              ""
## V138 "HDAC5"     ""              ""
## V139 "ATP6AP1"   ""              ""
## V140 "CLU"       ""              ""
## V141 "ACSL1"     ""              ""
## V142 "COL1A1"    ""              ""
## V143 "MRAS"      ""              ""
## V144 "PDE4DIP"   ""              ""
## V145 "AGL"       ""              ""
## V146 "ERBB3"     ""              ""
## V147 "GABARAPL2" ""              ""
## V148 "CAV3"      ""              ""
## V149 "BHLHE40"   ""              ""
## V150 "PPP1R3C"   ""              ""
## V151 "LARGE1"    ""              ""
## V152 "LPIN1"     ""              ""
## V153 "CDH13"     ""              ""
## V154 "NQO1"      ""              ""
## V155 "PRNP"      ""              ""
## V156 "PSEN2"     ""              ""
## V157 "DAPK2"     ""              ""
## V158 "LSP1"      ""              ""
## V159 "SLC6A8"    ""              ""
## V160 "REEP1"     ""              ""
## V161 "EIF4A2"    ""              ""
## V162 "SH2B1"     ""              ""
## V163 "MYBPC3"    ""              ""
## V164 "ITGA7"     ""              ""
## V165 "SPTAN1"    ""              ""
## V166 "SORBS3"    ""              ""
## V167 "PC"        ""              ""
## V168 "SCD"       ""              ""
## V169 "GNAO1"     ""              ""
## V170 "STC2"      ""              ""
## V171 "CFD"       ""              ""
## V172 "RB1"       ""              ""
## V173 "BAG1"      ""              ""
## V174 "ABLIM1"    ""              ""
## V175 "PTGIS"     ""              ""
## V176 "MAPRE3"    ""              ""
## V177 "OCEL1"     ""              ""
## V178 "SH3BGR"    ""              ""
## V179 "NOTCH1"    ""              ""
## V180 "TSC2"      ""              ""
## V181 "TGFB1"     ""              ""
## V182 "FDPS"      ""              ""
## V183 "CAMK2B"    ""              ""
## V184 "EPHB3"     ""              ""
## V185 "GADD45B"   ""              ""
## V186 "APP"       ""              ""
## V187 "APLNR"     ""              ""
## V188 "ITGB4"     ""              ""
```

```
## V189 "SOD3"      ""                ""
## V190 "FOXO4"     ""                ""
## V191 "EFS"       ""                ""
## V192 "PFKM"      ""                ""
## V193 "COL6A2"    ""                ""
## V194 "DTNA"      ""                ""
## V195 "KIFC3"     ""                ""
## V196 "SPARC"     ""                ""
## V197 "SPDEF"     ""                ""
## V198 "SLN"       ""                ""
## V199 "WWTR1"     ""                ""
## V200 "CD36"      ""                ""
## V201 "ADCY9"     ""                ""
## V202 "APOD"      ""                ""
##      INTERFERON_GAMMA_RESPONSE APICAL_JUNCTION APICAL_SURFACE
## V3   "STAT1"                   "ACTN1"         "B4GALT1"
## V4   "ISG15"                   "CLDN7"         "RHCG"
## V5   "IFIT1"                   "ACTN3"         "MAL"
## V6   "MX1"                     "CLDN19"        "LYPD3"
## V7   "IFIT3"                   "DLG1"          "PKHD1"
## V8   "IFI35"                   "TJP1"          "ATP6V0A4"
## V9   "IRF7"                    "COL17A1"       "CRYBG1"
## V10  "IFIT2"                   "NECTIN1"       "SHROOM2"
## V11  "OAS2"                    "CLDN9"         "SRPX"
## V12  "TAP1"                    "CDH3"          "MDGA1"
## V13  "EIF2AK2"                 "CTNND1"        "TMEM8B"
## V14  "RSAD2"                   "CDH1"          "THY1"
## V15  "MX2"                     "LIMA1"         "PCSK9"
## V16  "IRF1"                    "VCL"           "EPHB4"
## V17  "OAS3"                    "SHROOM2"       "DCBLD2"
## V18  "TNFSF10"                 "NECTIN3"       "GHRL"
## V19  "IRF9"                    "NECTIN2"       "LYN"
## V20  "CXCL10"                  "CLDN14"        "GAS1"
## V21  "IFI44"                   "PTPRC"         "FLOT2"
## V22  "BST2"                    "THY1"          "PLAUR"
## V23  "XAF1"                    "VASP"          "AKAP7"
## V24  "SP110"                   "ITGB1"         "ATP8B1"
## V25  "OASL"                    "ZYX"           "EFNA5"
## V26  "PSMB8"                   "ACTN4"         "SLC34A3"
## V27  "IFI44L"                  "CLDN4"         "APP"
## V28  "IFITM3"                  "CADM3"         "GSTM3"
## V29  "DDX60"                   "ITGA3"         "HSPB1"
## V30  "LGALS3BP"                "NF2"           "SLC2A4"
## V31  "GBP4"                    "B4GALT1"       "IL2RB"
## V32  "IRF8"                    "NEXN"          "RTN4RL1"
## V33  "PSMB9"                   "CDH6"          "NCOA6"
## V34  "PML"                     "ADAM15"        "SULF2"
## V35  "IFIH1"                   "PTK2"          "ADAM10"
## V36  "UBE2L6"                  "HADH"          "BRCA1"
## V37  "IFI27"                   "LAMB3"         "GATA3"
## V38  "ADAR"                    "CLDN11"        "AFAP1L2"
## V39  "LY6E"                    "CDH4"          "IL2RG"
## V40  "STAT2"                   "IRS1"          "CD160"
## V41  "CXCL9"                   "SORBS3"        "ADIPOR2"
```

```
## V42  "IL10RA"                "CLDN8"         "SLC22A12"
## V43  "PLA2G4A"               "EVL"           "NTNG1"
## V44  "TRIM21"                "CLDN15"        "SCUBE1"
## V45  "USP18"                 "THBS3"         "CX3CL1"
## V46  "PTGS2"                 "NECTIN4"       "CROCC"
## V47  "EPSTI1"                "JAM3"          ""
## V48  "C1S"                   "CDH11"         ""
## V49  "DDX58"                 "ITGB4"         ""
## V50  "IL15"                  "RASA1"         ""
## V51  "NLRC5"                 "AKT2"          ""
## V52  "NMI"                   "TMEM8B"        ""
## V53  "IDO1"                  "LAMA3"         ""
## V54  "PSMB10"                "RSU1"          ""
## V55  "CXCL11"                "ICAM1"         ""
## V56  "ITGB7"                 "CLDN18"        ""
## V57  "SAMHD1"                "GTF2F1"        ""
## V58  "HERC6"                 "TSC1"          ""
## V59  "CMPK2"                 "LAMC2"         ""
## V60  "SAMD9L"                "NRAP"          ""
## V61  "RTP4"                  "CTNNA1"        ""
## V62  "PTPN2"                 "CD99"          ""
## V63  "PARP14"                "FSCN1"         ""
## V64  "TNFAIP2"               "COL16A1"       ""
## V65  "IFITM2"                "GNAI2"         ""
## V66  "PLSCR1"                "TGFBI"         ""
## V67  "SOCS1"                 "MPP5"          ""
## V68  "CASP1"                 "JUP"           ""
## V69  "ICAM1"                 "ACTN2"         ""
## V70  "WARS1"                 "INSIG1"        ""
## V71  "PSME1"                 "LAYN"          ""
## V72  "ISG20"                 "PFN1"          ""
## V73  "IRF2"                  "CNN2"          ""
## V74  "TRIM14"                "TAOK2"         ""
## V75  "FCGR1A"                "AMIGO2"        ""
## V76  "MARCHF1"               "MDK"           ""
## V77  "SOCS3"                 "INPPL1"        ""
## V78  "JAK2"                  "CLDN6"         ""
## V79  "HLA-DMA"               "ARPC2"         ""
## V80  "PARP12"                "SRC"           ""
## V81  "TNFAIP6"               "PBX2"          ""
## V82  "TRIM26"                "MAPK14"        ""
## V83  "VCAM1"                 "MAP4K2"        ""
## V84  "CD274"                 "PTEN"          ""
## V85  "CIITA"                 "CALB2"         ""
## V86  "NAMPT"                 "CNTN1"         ""
## V87  "SELP"                  "TSPAN4"        ""
## V88  "GPR18"                 "VCAN"          ""
## V89  "FPR1"                  "CDH8"          ""
## V90  "HELZ2"                 "ATP1A3"        ""
## V91  "PSME2"                 "EPB41L2"       ""
## V92  "SERPING1"              "MYL9"          ""
## V93  "CCL5"                  "SPEG"          ""
## V94  "RNF31"                 "ADRA1B"        ""
## V95  "SOD2"                  "SYK"           ""
```

```
## V96  "TRIM25"                "CADM2"         ""
## V97  "LAP3"                  "ALOX15B"       ""
## V98  "PSMA3"                 "CX3CL1"        ""
## V99  "RNF213"                "MYH10"         ""
## V100 "PELI1"                 "DMP1"          ""
## V101 "CFB"                   "CDSN"          ""
## V102 "CD86"                  "MAPK13"        ""
## V103 "TXNIP"                 "MYL12B"        ""
## V104 "HLA-DQA1"              "RAC2"          ""
## V105 "GCH1"                  "FBN1"          ""
## V106 "PNP"                   "DSC1"          ""
## V107 "CCL7"                  "CD34"          ""
## V108 "PTPN6"                 "ICAM4"         ""
## V109 "SPPL2A"                "MSN"           ""
## V110 "IL4R"                  "MAPK11"        ""
## V111 "PNPT1"                 "ACTC1"         ""
## V112 "DHX58"                 "TRAF1"         ""
## V113 "BTG1"                  "CRB3"          ""
## V114 "CASP8"                 "ITGA2"         ""
## V115 "IFI30"                 "ITGA10"        ""
## V116 "CCL2"                  "BAIAP2"        ""
## V117 "FGL2"                  "ARHGEF6"       ""
## V118 "CASP7"                 "ACTG1"         ""
## V119 "SECTM1"                "MVD"           ""
## V120 "IL15RA"                "PDZD3"         ""
## V121 "CD40"                  "ADAM9"         ""
## V122 "TRAFD1"                "PCDH1"         ""
## V123 "HLA-DRB1"              "SLIT2"         ""
## V124 "GBP6"                  "KRT31"         ""
## V125 "LCP2"                  "SGCE"          ""
## V126 "HLA-G"                 "GNAI1"         ""
## V127 "MT2A"                  "PIK3CB"        ""
## V128 "RIPK1"                 "NLGN2"         ""
## V129 "KLRK1"                 "YWHAH"         ""
## V130 "UPP1"                  "PARVA"         ""
## V131 "PSMB2"                 "CRAT"          ""
## V132 "TDRD7"                 "ADAMTS5"       ""
## V133 "HIF1A"                 "AMH"           ""
## V134 "EIF4E3"                "EGFR"          ""
## V135 "VAMP8"                 "ICAM2"         ""
## V136 "PFKP"                  "CD274"         ""
## V137 "CD38"                  "CDH15"         ""
## V138 "ZBP1"                  "SHC1"          ""
## V139 "BANK1"                 "MPZL2"         ""
## V140 "TOR1B"                 "WNK4"          ""
## V141 "RBCK1"                 "NFASC"         ""
## V142 "PDE4B"                 "PIK3R3"        ""
## V143 "MVP"                   "SDC3"          ""
## V144 "IL7"                   "SIRPA"         ""
## V145 "BPGM"                  "GRB7"          ""
## V146 "CMTR1"                 "FLNC"          ""
## V147 "AUTS2"                 "PARD6G"        ""
## V148 "B2M"                   "COL9A1"        ""
## V149 "RIPK2"                 "NRXN2"         ""
```

```
## V150 "CD69"                    "MAP3K20"       ""
## V151 "MYD88"                   "SLC30A3"       ""
## V152 "PSMA2"                   "RHOF"          ""
## V153 "PIM1"                    "BMP1"          ""
## V154 "NOD1"                    "MMP2"          ""
## V155 "CFH"                     "ICAM5"         ""
## V156 "TAPBP"                   "VWF"           ""
## V157 "SLC25A28"                "MYH9"          ""
## V158 "PTPN1"                   "CD209"         ""
## V159 "TNFAIP3"                 "VCAM1"         ""
## V160 "SSPN"                    "DHX16"         ""
## V161 "NUP93"                   "ACTG2"         ""
## V162 "MTHFD2"                  "NEGR1"         ""
## V163 "CDKN1A"                  "NF1"           ""
## V164 "IRF4"                    "ADAM23"        ""
## V165 "NFKB1"                   "PLCG1"         ""
## V166 "BATF2"                   "KCNH2"         ""
## V167 "HLA-B"                   "CERCAM"        ""
## V168 "LATS2"                   "NRTN"          ""
## V169 "IRF5"                    "IKBKG"         ""
## V170 "SLAMF7"                  "DSC3"          ""
## V171 "ISOC1"                   "ACTB"          ""
## V172 "P2RY14"                  "TUBG1"         ""
## V173 "STAT3"                   "PPP2R2C"       ""
## V174 "NCOA3"                   "HRAS"          ""
## V175 "HLA-A"                   "MMP9"          ""
## V176 "IL6"                     "TNFRSF11B"     ""
## V177 "GZMA"                    "PKD1"          ""
## V178 "IFNAR2"                  "CDK8"          ""
## V179 "CD74"                    "FYB1"          ""
## V180 "RAPGEF6"                 "AMIGO1"        ""
## V181 "CASP4"                   "CD276"         ""
## V182 "FAS"                     "GAMT"          ""
## V183 "OGFR"                    "NLGN3"         ""
## V184 "ARL4A"                   "SKAP2"         ""
## V185 "SRI"                     "RRAS"          ""
## V186 "LYSMD2"                  "CAP1"          ""
## V187 "CSF2RB"                  "EXOC4"         ""
## V188 "ST3GAL5"                 "ACTA1"         ""
## V189 "C1R"                     "TIAL1"         ""
## V190 "CASP3"                   "LDLRAP1"       ""
## V191 "CMKLR1"                  "VAV2"          ""
## V192 "NFKBIA"                  "AKT3"          ""
## V193 "METTL7B"                 "SYMPK"         ""
## V194 "ST8SIA4"                 "STX4"          ""
## V195 "XCL1"                    "PECAM1"        ""
## V196 "IL2RB"                   "MADCAM1"       ""
## V197 "VAMP5"                   "ITGA9"         ""
## V198 "IL18BP"                  "CD86"          ""
## V199 "ZNFX1"                   "TRO"           ""
## V200 "ARID5B"                  "CLDN5"         ""
## V201 "APOL6"                   "MPZL1"         ""
## V202 "STAT4"                   "WASL"          ""
##      HEDGEHOG_SIGNALING COMPLEMENT UNFOLDED_PROTEIN_RESPONSE
```

```
## V3   "SHH"            "C2"       "ATF4"
## V4   "PTCH1"          "C1S"      "HERPUD1"
## V5   "NRCAM"          "CFB"      "PARN"
## V6   "NRP1"           "C1R"      "EXOSC4"
## V7   "SCG2"           "SERPINE1" "HSP90B1"
## V8   "AMOT"           "MMP14"    "XBP1"
## V9   "UNC5C"          "SERPING1" "EXOSC9"
## V10  "ADGRG1"         "CTSL"     "HSPA5"
## V11  "HEY1"           "F5"       "ATF3"
## V12  "GLI1"           "MMP13"    "EXOSC1"
## V13  "THY1"           "F7"       "EXOSC5"
## V14  "SLIT1"          "CTSS"     "ASNS"
## V15  "CDK6"           "LGMN"     "ARFGAP1"
## V16  "HEY2"           "PLG"      "WFS1"
## V17  "NRP2"           "C1QA"     "SRPRB"
## V18  "TLE3"           "CASP1"    "DNAJB9"
## V19  "TLE1"           "GZMA"     "TSPYL2"
## V20  "L1CAM"          "ADAM9"    "NFYA"
## V21  "PLG"            "CALM3"    "CALR"
## V22  "NKX6-1"         "C1QC"     "KHSRP"
## V23  "NF1"            "TIMP1"    "DNAJC3"
## V24  "RASA1"          "DPP4"     "EXOSC2"
## V25  "ETS2"           "KLK1"     "NOP14"
## V26  "RTN1"           "KLKB1"    "ATF6"
## V27  "CRMP1"          "CD59"     "HYOU1"
## V28  "MYH9"           "CR2"      "RRP9"
## V29  "VEGFA"          "MMP15"    "NOP56"
## V30  "CELSR1"         "LAP3"     "CXXC1"
## V31  "CNTFR"          "SPOCK2"   "IGFBP1"
## V32  "ACHE"           "F10"      "CNOT4"
## V33  "PML"            "CTSB"     "DCP2"
## V34  "CDK5R1"         "SERPINA1" "PDIA6"
## V35  "VLDLR"          "CTSO"     "ATP6V0D1"
## V36  "OPHN1"          "CD40LG"   "PREB"
## V37  "LDB1"           "CBLB"     "SEC31A"
## V38  "DPYSL2"         "PDP1"     "GOSR2"
## V39  ""               "C4BPB"    "SERP1"
## V40  ""               "PLEK"     "NFYB"
## V41  ""               "GP9"      "NHP2"
## V42  ""               "PLAUR"    "DCTN1"
## V43  ""               "C3"       "SLC7A5"
## V44  ""               "F2"       "SSR1"
## V45  ""               "CASP4"    "EDEM1"
## V46  ""               "STX4"     "EDC4"
## V47  ""               "CTSC"     "EIF2AK3"
## V48  ""               "USP15"    "MTHFD2"
## V49  ""               "CR1"      "SRPRA"
## V50  ""               "DUSP6"    "NOLC1"
## V51  ""               "SERPINB2" "ERN1"
## V52  ""               "GPD2"     "FKBP14"
## V53  ""               "CFH"      "ZBTB17"
## V54  ""               "FN1"      "WIPI1"
## V55  ""               "CD36"     "YIF1A"
## V56  ""               "CA2"      "CCL2"
```

```
## V57  ""              "PSMB9"    "DKC1"
## V58  ""              "APOBEC3G" "EIF4EBP1"
## V59  ""              "FCN1"     "EIF4A1"
## V60  ""              "GZMK"     "EIF2S1"
## V61  ""              "PDGFB"    "TATDN2"
## V62  ""              "CLU"      "XPOT"
## V63  ""              "CASP10"   "LSM4"
## V64  ""              "LRP1"     "CHAC1"
## V65  ""              "CTSD"     "STC2"
## V66  ""              "S100A9"   "PDIA5"
## V67  ""              "WAS"      "NABP1"
## V68  ""              "BRPF3"    "LSM1"
## V69  ""              "PLAT"     "SDAD1"
## V70  ""              "CDA"      "EIF4A2"
## V71  ""              "MT3"      "EIF4E"
## V72  ""              "CASP7"    "IARS1"
## V73  ""              "PRSS36"   "DDX10"
## V74  ""              "PFN1"     "GEMIN4"
## V75  ""              "GZMB"     "TARS1"
## V76  ""              "RNF4"     "ALDH18A1"
## V77  ""              "ZEB1"     "DDIT4"
## V78  ""              "CASP5"    "HSPA9"
## V79  ""              "IRF1"     "SEC11A"
## V80  ""              "CPQ"      "EIF4A3"
## V81  ""              "CDK5R1"   "POP4"
## V82  ""              "ATOX1"    "ERO1A"
## V83  ""              "PIK3CA"   "CEBPG"
## V84  ""              "TMPRSS6"  "BAG3"
## V85  ""              "CPM"      "KDELR3"
## V86  ""              "RCE1"     "CEBPB"
## V87  ""              "CALM1"    "CNOT2"
## V88  ""              "DOCK9"    "SHC1"
## V89  ""              "KYNU"     "SPCS3"
## V90  ""              "RASGRP1"  "H2AX"
## V91  ""              "USP14"    "SLC1A4"
## V92  ""              "LCP2"     "RPS14"
## V93  ""              "GP1BA"    "NPM1"
## V94  ""              "KIF2A"    "CNOT6"
## V95  ""              "GNB4"     "CKS1B"
## V96  ""              "LCK"      "PSAT1"
## V97  ""              "OLR1"     "EIF4G1"
## V98  ""              "PREP"     "YWHAZ"
## V99  ""              "MSRB1"    "SLC30A5"
## V100 ""              "LTA4H"    "MTREX"
## V101 ""              "ZFPM2"    "KIF5B"
## V102 ""              "LYN"      "DCP1A"
## V103 ""              "ACTN2"    "IFIT1"
## V104 ""              "SIRT6"    "IMP3"
## V105 ""              "APOC1"    "SPCS1"
## V106 ""              "PRKCD"    "DNAJA4"
## V107 ""              "ITGAM"    "VEGFA"
## V108 ""              "DGKH"     "TTC37"
## V109 ""              "LTF"      "TUBB2A"
## V110 ""              "MAFF"     "FUS"
```

```
## V111 ""              "KCNIP2"   "EXOSC10"
## V112 ""              "PCLO"     "EEF2"
## V113 ""              "DOCK10"   "EXOC2"
## V114 ""              "SH2B3"    "PAIP1"
## V115 ""              "RABIF"    "BANF1"
## V116 ""              "SRC"      ""
## V117 ""              "HPCAL4"   ""
## V118 ""              "CD46"     ""
## V119 ""              "PRDM4"    ""
## V120 ""              "GNAI3"    ""
## V121 ""              "C9"       ""
## V122 ""              "PPP2CB"   ""
## V123 ""              "IRF2"     ""
## V124 ""              "FYN"      ""
## V125 ""              "JAK2"     ""
## V126 ""              "PLA2G4A"  ""
## V127 ""              "PRCP"     ""
## V128 ""              "USP8"     ""
## V129 ""              "RHOG"     ""
## V130 ""              "L3MBTL4"  ""
## V131 ""              "LAMP2"    ""
## V132 ""              "PIM1"     ""
## V133 ""              "CXCL1"    ""
## V134 ""              "F3"       ""
## V135 ""              "GNAI2"    ""
## V136 ""              "CASP9"    ""
## V137 ""              "XPNPEP1"  ""
## V138 ""              "PLSCR1"   ""
## V139 ""              "IRF7"     ""
## V140 ""              "CD55"     ""
## V141 ""              "HSPA5"    ""
## V142 ""              "GNB2"     ""
## V143 ""              "DYRK2"    ""
## V144 ""              "PLA2G7"   ""
## V145 ""              "S100A12"  ""
## V146 ""              "GRB2"     ""
## V147 ""              "PHEX"     ""
## V148 ""              "GNGT2"    ""
## V149 ""              "DOCK4"    ""
## V150 ""              "MMP12"    ""
## V151 ""              "KCNIP3"   ""
## V152 ""              "FDX1"     ""
## V153 ""              "TIMP2"    ""
## V154 ""              "MMP8"     ""
## V155 ""              "FCER1G"   ""
## V156 ""              "RBSN"     ""
## V157 ""              "ANXA5"    ""
## V158 ""              "CTSV"     ""
## V159 ""              "GCA"      ""
## V160 ""              "EHD1"     ""
## V161 ""              "PRSS3"    ""
## V162 ""              "COL4A2"   ""
## V163 ""              "CSRP1"    ""
## V164 ""              "PIK3R5"   ""
```

```
## V165 ""                "SERPINC1" ""
## V166 ""                "ANG"      ""
## V167 ""                "APOBEC3F" ""
## V168 ""                "GATA3"    ""
## V169 ""                "DUSP5"    ""
## V170 ""                "CASP3"    ""
## V171 ""                "USP16"    ""
## V172 ""                "CP"       ""
## V173 ""                "PSEN1"    ""
## V174 ""                "LIPA"     ""
## V175 ""                "PCSK9"    ""
## V176 ""                "DGKG"     ""
## V177 ""                "GNG2"     ""
## V178 ""                "ME1"      ""
## V179 ""                "GMFB"     ""
## V180 ""                "SCG3"     ""
## V181 ""                "PPP4C"    ""
## V182 ""                "CCL5"     ""
## V183 ""                "CTSH"     ""
## V184 ""                "F8"       ""
## V185 ""                "APOA4"    ""
## V186 ""                "IL6"      ""
## V187 ""                "AKAP10"   ""
## V188 ""                "ERAP2"    ""
## V189 ""                "VCPIP1"   ""
## V190 ""                "HSPA1A"   ""
## V191 ""                "RAF1"     ""
## V192 ""                "NOTCH4"   ""
## V193 ""                "ADRA2B"   ""
## V194 ""                "CEBPB"    ""
## V195 ""                "HNF4A"    ""
## V196 ""                "LGALS3"   ""
## V197 ""                "TNFAIP3"  ""
## V198 ""                "CDH13"    ""
## V199 ""                "ITIH1"    ""
## V200 ""                "TFPI2"    ""
## V201 ""                "PIK3CG"   ""
## V202 ""                "S100A13"  ""
##      PI3K_AKT_MTOR_SIGNALING MTORC1_SIGNALING E2F_TARGETS MYC_TARGETS_V1
## V3   "MAPK8"                 "FADS1"          "AURKA"     "PCNA"
## V4   "PIK3R3"                "DDIT4"          "BRCA2"     "PSMD8"
## V5   "GRB2"                  "CALR"           "CCP110"    "PSMD7"
## V6   "NFKBIB"                "HK2"            "CENPE"     "SET"
## V7   "MAP2K6"                "PGK1"           "CKS2"      "SNRPA1"
## V8   "MAPK9"                 "SLC7A5"         "DCLRE1B"   "RAN"
## V9   "AKT1"                  "CTSC"           "DNMT1"     "SRSF2"
## V10  "MAPK1"                 "ACSL3"          "DONSON"    "G3BP1"
## V11  "PLCG1"                 "SLC1A5"         "EED"       "STARD7"
## V12  "TRIB3"                 "M6PR"           "GINS1"     "NPM1"
## V13  "GSK3B"                 "TFRC"           "GINS4"     "BUB3"
## V14  "MAP2K3"                "DDIT3"          "H2AZ1"     "EIF3D"
## V15  "CDKN1A"                "TMEM97"         "LIG1"      "XPO1"
## V16  "RAC1"                  "IFRD1"          "MAD2L1"    "FBL"
## V17  "RIPK1"                 "PLOD2"          "MCM2"      "EIF4A1"
```

```
## V18  "AKT1S1"              "TUBA4A"         "MCM4"      "CANX"
## V19  "ACTR2"               "PSAT1"          "MCM5"      "NAP1L1"
## V20  "PRKAR2A"             "CORO1A"         "MCM7"      "CBX3"
## V21  "YWHAB"               "LDHA"           "MELK"      "CCT3"
## V22  "HRAS"                "MTHFD2"         "MMS22L"    "C1QBP"
## V23  "PDK1"                "FADS2"          "NAA38"     "U2AF1"
## V24  "PIKFYVE"             "VLDLR"          "NASP"      "UBE2L3"
## V25  "TBK1"                "WARS1"          "NUDT21"    "SSBP1"
## V26  "ACTR3"               "SCD"            "NUP205"    "SRSF1"
## V27  "E2F1"                "P4HA1"          "ORC6"      "TCP1"
## V28  "MYD88"               "ACTR2"          "PCNA"      "MCM2"
## V29  "ITPR2"               "IDH1"           "PLK4"      "EIF3B"
## V30  "SQSTM1"              "SLC2A1"         "POLE"      "PSMD14"
## V31  "RPS6KA1"             "GBE1"           "PRIM2"     "SNRPA"
## V32  "PTPN11"              "SERPINH1"       "RAD51AP1"  "PWP1"
## V33  "MAPKAP1"             "NUPR1"          "RFC2"      "APEX1"
## V34  "PLCB1"               "PSMG1"          "RPA2"      "TXNL4A"
## V35  "RAF1"                "PSPH"           "RPA3"      "HNRNPR"
## V36  "CAMK4"               "NAMPT"          "SUV39H1"   "PSMB2"
## V37  "RPTOR"               "CDKN1A"         "TMPO"      "HPRT1"
## V38  "CFL1"                "BHLHE40"        "UBE2T"     "MCM6"
## V39  "CDK4"                "HSPA9"          "WDR90"     "NME1"
## V40  "TRAF2"               "HSPA5"          "CDK1"      "SNRPD1"
## V41  "GNGT1"               "EGLN3"          "MCM3"      "EEF1B2"
## V42  "UBE2N"               "LGMN"           "TOP2A"     "HSPD1"
## V43  "ADCY2"               "PNP"            "MCM6"      "CAD"
## V44  "CDKN1B"              "XBP1"           "BIRC5"     "RPL18"
## V45  "VAV3"                "SLA"            "CCNB2"     "PGK1"
## V46  "FGF6"                "DDX39A"         "RRM2"      "DDX18"
## V47  "ECSIT"               "HSPE1"          "HMGB2"     "RPS2"
## V48  "RALB"                "ACLY"           "BUB1B"     "LDHA"
## V49  "ARF1"                "SLC7A11"        "RFC3"      "RUVBL2"
## V50  "MKNK1"               "SSR1"           "EZH2"      "RNPS1"
## V51  "CDK1"                "GLA"            "CHEK1"     "EIF2S1"
## V52  "PTEN"                "SQSTM1"         "SMC4"      "RANBP1"
## V53  "ARHGDIA"             "PDK1"           "MKI67"     "MCM5"
## V54  "GRK2"                "PSMC2"          "CDC20"     "IARS1"
## V55  "FGF17"               "PRDX1"          "PLK1"      "UBE2E1"
## V56  "DDIT3"               "SERP1"          "KIF2C"     "MYC"
## V57  "IRAK4"               "TRIB3"          "DLGAP5"    "AP3S1"
## V58  "TIAM1"               "NFIL3"          "AURKB"     "RFC4"
## V59  "CDK2"                "HMGCS1"         "CDC25A"    "DUT"
## V60  "SFN"                 "GOT1"           "TRIP13"    "PSMA4"
## V61  "PRKCB"               "TPI1"           "H2AX"      "RPS3"
## V62  "GNA14"               "ELOVL6"         "HMMR"      "SNRPG"
## V63  "EIF4E"               "ASNS"           "E2F8"      "PHB2"
## V64  "CLTC"                "PSMD14"         "BRCA1"     "SSB"
## V65  "TSC2"                "PSMA4"          "MYBL2"     "EIF4H"
## V66  "FGF22"               "PPA1"           "POLD1"     "SRSF3"
## V67  "PPP1CA"              "HPRT1"          "RACGAP1"   "CCT4"
## V68  "DUSP3"               "AURKA"          "CKS1B"     "TFDP1"
## V69  "HSP90B1"             "HMGCR"          "KPNA2"     "EIF2S2"
## V70  "IL4"                 "GAPDH"          "MSH2"      "CDK4"
## V71  "STAT2"               "DHFR"           "CDKN3"     "SNRPD3"
```

```
## V72  "SLA"          "DHCR7"      "ATAD2"     "PSMD1"
## V73  "EGFR"         "IMMT"       "RPA1"      "RACK1"
## V74  "PLA2G12A"     "UCHL5"      "STMN1"     "GOT2"
## V75  "MAPK10"       "YKT6"       "TIPIN"     "PABPC4"
## V76  "CALR"         "INSIG1"     "TK1"       "CCT5"
## V77  "THEM4"        "SQLE"       "CDCA8"     "PRPS2"
## V78  "RIT1"         "IGFBP5"     "ESPL1"     "ACP1"
## V79  "MKNK2"        "IFI30"      "NCAPD2"    "PRPF31"
## V80  "PPP2R1B"      "CYP51A1"    "RANBP1"    "CCT2"
## V81  "CAB39L"       "FGL2"       "MRE11"     "KARS1"
## V82  "ARPC3"        "ENO1"       "KIF4A"     "DEK"
## V83  "PITX2"        "IDI1"       "LMNB1"     "EIF4G2"
## V84  "NCK1"         "CYB5B"      "KIF22"     "XPOT"
## V85  "IL2RG"        "SHMT2"      "UNG"       "SRM"
## V86  "PFN1"         "TXNRD1"     "SMC1A"     "UBA2"
## V87  "FASLG"        "G6PD"       "CCNE1"     "KPNB1"
## V88  "NOD1"         "SLC9A3R1"   "CDCA3"     "PSMA7"
## V89  "DAPP1"        "RAB1A"      "ASF1B"     "TRA2B"
## V90  "UBE2D3"       "EBP"        "POLA2"     "COX5A"
## V91  "CAB39"        "PNO1"       "TIMELESS"  "PA2G4"
## V92  "AP2M1"        "PIK3R3"     "HELLS"     "PCBP1"
## V93  "MAP3K7"       "ACTR3"      "UBE2S"     "HNRNPA1"
## V94  "PRKAG1"       "LDLR"       "PRKDC"     "CCNA2"
## V95  "CSNK2B"       "SLC2A3"     "RAN"       "PPIA"
## V96  "PRKAA2"       "UBE2D3"     "USP1"      "EIF3J"
## V97  "ATF1"         "ELOVL5"     "SPAG5"     "ORC2"
## V98  "SLC2A1"       "CACYBP"     "POLD3"     "PSMA2"
## V99  "PIN1"         "EDEM1"      "DUT"       "SYNCRIP"
## V100 "TNFRSF1A"     "ATP6V1D"    "TACC3"     "HDAC2"
## V101 "LCK"          "TES"        "KIF18B"    "LSM2"
## V102 "RPS6KA3"      "TM7SF2"     "CDC25B"    "VBP1"
## V103 "NGF"          "PSMA3"      "SRSF1"     "PSMA6"
## V104 "CXCR4"        "ITGB2"      "GINS3"     "CNBP"
## V105 "ACACA"        "AK4"        "NOLC1"     "CDK2"
## V106 "SMAD2"        "SLC1A4"     "SLBP"      "TARDBP"
## V107 "PAK4"         "TOMM40"     "CHEK2"     "NOLC1"
## V108 ""             "SLC6A6"     "SPC25"     "GSPT1"
## V109 ""             "PPIA"       "BARD1"     "HNRNPA2B1"
## V110 ""             "ADD3"       "DCTPP1"    "ETF1"
## V111 ""             "ME1"        "SMC3"      "RPL6"
## V112 ""             "CCNF"       "RNASEH2A"  "TOMM70"
## V113 ""             "SLC37A4"    "DEK"       "PTGES3"
## V114 ""             "ALDOA"      "CENPM"     "PSMA1"
## V115 ""             "BTG2"       "RAD51C"    "PSMC6"
## V116 ""             "UFM1"       "CBX5"      "CTPS1"
## V117 ""             "CCNG1"      "RFC1"      "HSPE1"
## V118 ""             "STC1"       "POLD2"     "FAM120A"
## V119 ""             "NMT1"       "DSCC1"     "PPM1G"
## V120 ""             "PSMC6"      "ILF3"      "HNRNPD"
## V121 ""             "FDXR"       "DEPDC1"    "SERBP1"
## V122 ""             "RRM2"       "DCK"       "CSTF2"
## V123 ""             "DHCR24"     "CDKN2C"    "PRDX4"
## V124 ""             "PSMC4"      "MYC"       "EIF4E"
## V125 ""             "CTH"        "TCF19"     "ODC1"
```

```
## V126 ""                    "PSME3"          "RAD1"      "USP1"
## V127 ""                    "CFP"            "LBR"       "RPL22"
## V128 ""                    "POLR3G"         "NBN"       "HNRNPA3"
## V129 ""                    "ACACA"          "PTTG1"     "NCBP1"
## V130 ""                    "QDPR"           "UBR7"      "RPLP0"
## V131 ""                    "MCM2"           "POLE4"     "ABCE1"
## V132 ""                    "PSMD12"         "TUBG1"     "EIF1AX"
## V133 ""                    "SC5D"           "CTCF"      "YWHAE"
## V134 ""                    "CANX"           "CNOT9"     "MCM7"
## V135 ""                    "RPN1"           "TUBB"      "YWHAQ"
## V136 ""                    "HSPA4"          "SMC6"      "VDAC1"
## V137 ""                    "NIBAN1"         "ZW10"      "SMARCC1"
## V138 ""                    "TBK1"           "PA2G4"     "SNRPD2"
## V139 ""                    "SEC11A"         "SSRP1"     "HNRNPU"
## V140 ""                    "BCAT1"          "NAP1L1"    "HDDC2"
## V141 ""                    "PSMB5"          "ANP32E"    "PSMD3"
## V142 ""                    "PSMD13"         "HMGB3"     "RRM1"
## V143 ""                    "PGM1"           "IPO7"      "SF3A1"
## V144 ""                    "PLK1"           "RAD21"     "LSM7"
## V145 ""                    "GLRX"           "CDK4"      "ERH"
## V146 ""                    "COPS5"          "CDKN1A"    "RPL14"
## V147 ""                    "ETF1"           "BRMS1L"    "PSMB3"
## V148 ""                    "GSK3B"          "CTPS1"     "IFRD1"
## V149 ""                    "NUP205"         "RAD50"     "NCBP2"
## V150 ""                    "SORD"           "TRA2B"     "GLO1"
## V151 ""                    "PHGDH"          "CSE1L"     "NDUFAB1"
## V152 ""                    "GMPS"           "PAICS"     "CUL1"
## V153 ""                    "RRP9"           "STAG1"     "NHP2"
## V154 ""                    "EEF1E1"         "LUC7L3"    "CLNS1A"
## V155 ""                    "LTA4H"          "PPM1D"     "TRIM28"
## V156 ""                    "SDF2L1"         "NME1"      "RSL1D1"
## V157 ""                    "FKBP2"          "SRSF2"     "HNRNPC"
## V158 ""                    "RDH11"          "XPO1"      "COPS5"
## V159 ""                    "CXCR4"          "HNRNPD"    "XRCC6"
## V160 ""                    "MLLT11"         "PMS2"      "SLC25A3"
## V161 ""                    "GCLC"           "ASF1A"     "MRPL9"
## V162 ""                    "TCEA1"          "EXOSC8"    "POLE3"
## V163 ""                    "MAP2K3"         "MLH1"      "POLD2"
## V164 ""                    "HSPD1"          "NUP107"    "H2AZ1"
## V165 ""                    "SYTL2"          "ORC2"      "AIMP2"
## V166 ""                    "MCM4"           "TP53"      "NOP56"
## V167 ""                    "PPP1R15A"       "TFRC"      "PRDX3"
## V168 ""                    "USO1"           "HMGA1"     "MRPS18B"
## V169 ""                    "NFKBIB"         "PSIP1"     "EPRS1"
## V170 ""                    "UNG"            "DDX39A"    "KPNA2"
## V171 ""                    "GTF2H1"         "SNRPB"     "HSP90AB1"
## V172 ""                    "RPA1"           "CDKN1B"    "RPL34"
## V173 ""                    "HSP90B1"        "MTHFD2"    "SRPK1"
## V174 ""                    "ERO1A"          "WEE1"      "MAD2L1"
## V175 ""                    "GSR"            "PRDX4"     "DHX15"
## V176 ""                    "PITPNB"         "PHF5A"     "MCM4"
## V177 ""                    "EPRS1"          "TBRG4"     "RPS5"
## V178 ""                    "SRD5A1"         "SHMT1"     "CCT7"
## V179 ""                    "TUBG1"          "PRPS1"     "HDGF"
```

```
## V180 ""                    "MTHFD2L"        "DIAPH3"    "RPS6"
## V181 ""                    "ADIPOR2"        "NUP153"    "SNRPB2"
## V182 ""                    "NUFIP1"         "PSMC3IP"   "PSMC4"
## V183 ""                    "CDC25A"         "XRCC6"     "CDC20"
## V184 ""                    "PDAP1"          "PNN"       "TUFM"
## V185 ""                    "STARD4"         "HUS1"      "RRP9"
## V186 ""                    "BUB1"           "RBBP7"     "CDC45"
## V187 ""                    "ARPC5L"         "PDS5B"     "TYMS"
## V188 ""                    "GPI"            "NOP56"     "ILF2"
## V189 ""                    "EIF2S2"         "MXD3"      "VDAC3"
## V190 ""                    "CD9"            "PPP1R8"    "IMPDH2"
## V191 ""                    "ATP2A2"         "GSPT1"     "SF3B3"
## V192 ""                    "GGA2"           "CDKN2A"    "NOP16"
## V193 ""                    "HMBS"           "AK2"       "SRSF7"
## V194 ""                    "RIT1"           "CIT"       "GNL3"
## V195 ""                    "SKAP2"          "ING3"      "EXOSC7"
## V196 ""                    "STIP1"          "JPT1"      "MRPL23"
## V197 ""                    "DAPP1"          "POP7"      "RAD23B"
## V198 ""                    "ABCF2"          "SYNCRIP"   "RPS10"
## V199 ""                    "NFYC"           "EIF2S1"    "PHB"
## V200 ""                    "ATP5MC1"        "LYAR"      "DDX21"
## V201 ""                    "PFKL"           "PAN2"      "CYC1"
## V202 ""                    "CCT6A"          "SPC24"     "PABPC1"
##      MYC_TARGETS_V2 EPITHELIAL_MESENCHYMAL_TRANSITION INFLAMMATORY_RESPONSE
## V3   "SLC19A1"      "COL3A1"                          "CXCL10"
## V4   "MRTO4"        "COL5A2"                          "CCL2"
## V5   "TMEM97"       "COL5A1"                          "CCL5"
## V6   "RRP9"         "FBN1"                            "FPR1"
## V7   "PES1"         "COL1A1"                          "CCL20"
## V8   "TFB2M"        "FN1"                             "IL1A"
## V9   "EXOSC5"       "COL6A3"                          "CXCL8"
## V10  "IPO4"         "SERPINE1"                        "CCL7"
## V11  "NDUFAF4"      "COL1A2"                          "CCL22"
## V12  "NOC4L"        "COL4A1"                          "CXCL11"
## V13  "MYC"          "COL4A2"                          "CCR7"
## V14  "SRM"          "VCAN"                            "EDN1"
## V15  "PA2G4"        "IGFBP3"                          "CD40"
## V16  "GNL3"         "TGFBI"                           "CXCL9"
## V17  "NOLC1"        "SPARC"                           "IL6"
## V18  "WDR43"        "LUM"                             "IL1B"
## V19  "RABEPK"       "LAMC1"                           "TLR2"
## V20  "NOP16"        "LOX"                             "IL1R1"
## V21  "TBRG4"        "LAMC2"                           "CD69"
## V22  "DDX18"        "CCN2"                            "ICAM1"
## V23  "NIP7"         "TAGLN"                           "CCRL2"
## V24  "WDR74"        "COL7A1"                          "AQP9"
## V25  "BYSL"         "LOXL2"                           "EREG"
## V26  "HSPD1"        "COL6A2"                          "C3AR1"
## V27  "PLK4"         "ITGAV"                           "GNA15"
## V28  "NOP2"         "THBS2"                           "CMKLR1"
## V29  "PPAN"         "COL16A1"                         "PTGER4"
## V30  "NOP56"        "NNMT"                            "LIF"
## V31  "RCL1"         "TPM1"                            "IL15"
## V32  "NPM1"         "CDH2"                            "NAMPT"
```

```
## V33  "AIMP2"        "MMP2"                    "OPRK1"
## V34  "RRP12"        "COL11A1"                 "ITGB8"
## V35  "PPRC1"        "THBS1"                   "PTAFR"
## V36  "TCOF1"        "FAP"                     "ADM"
## V37  "MCM5"         "BGN"                     "PLAUR"
## V38  "HK2"          "SERPINH1"                "NFKB1"
## V39  "CBX3"         "FSTL1"                   "INHBA"
## V40  "PLK1"         "POSTN"                   "OSM"
## V41  "PHB"          "THY1"                    "TNFSF10"
## V42  "MCM4"         "SPP1"                    "TNFSF15"
## V43  "CDK4"         "TNC"                     "IFNGR2"
## V44  "DUSP2"        "TFPI2"                   "ADGRE1"
## V45  "MYBBP1A"      "NID2"                    "IL12B"
## V46  "UTP20"        "ITGB5"                   "CSF1"
## V47  "PRMT3"        "MMP3"                    "CXCL6"
## V48  "FARSA"        "VIM"                     "TNFRSF9"
## V49  "MAP3K6"       "LOXL1"                   "LYN"
## V50  "LAS1L"        "FBLN5"                   "ACVR2A"
## V51  "PUS1"         "COL12A1"                 "LDLR"
## V52  "HSPE1"        "ELN"                     "BDKRB1"
## V53  "SLC29A2"      "CDH11"                   "HRH1"
## V54  "DCTPP1"       "COMP"                    "F3"
## V55  "SUPV3L1"      "SPOCK1"                  "BST2"
## V56  "SORD"         "BMP1"                    "PTGIR"
## V57  "IMP4"         "IL32"                    "CD55"
## V58  "GRWD1"        "LAMA3"                   "CALCRL"
## V59  "UNG"          "TIMP1"                   "CSF3"
## V60  "MPHOSPH10"    "QSOX1"                   "GPR132"
## V61  ""             "TIMP3"                   "IL4R"
## V62  ""             "VCAM1"                   "NLRP3"
## V63  ""             "CCN1"                    "IL15RA"
## V64  ""             "EDIL3"                   "ADORA2B"
## V65  ""             "CALD1"                   "GCH1"
## V66  ""             "MAGEE1"                  "OLR1"
## V67  ""             "FBLN1"                   "PTGER2"
## V68  ""             "SGCB"                    "CSF3R"
## V69  ""             "ECM1"                    "MYC"
## V70  ""             "LAMA2"                   "RELA"
## V71  ""             "FSTL3"                   "TNFAIP6"
## V72  ""             "TPM2"                    "IL7R"
## V73  ""             "INHBA"                   "IL18"
## V74  ""             "DAB2"                    "GABBR1"
## V75  ""             "EMP3"                    "CD82"
## V76  ""             "BASP1"                   "TNFSF9"
## V77  ""             "ITGA5"                   "NMUR1"
## V78  ""             "MGP"                     "IL2RB"
## V79  ""             "VEGFA"                   "TLR1"
## V80  ""             "CXCL1"                   "LPAR1"
## V81  ""             "WNT5A"                   "IRAK2"
## V82  ""             "SDC1"                    "RIPK2"
## V83  ""             "PLOD2"                   "MMP14"
## V84  ""             "PCOLCE"                  "P2RX7"
## V85  ""             "GREM1"                   "SLC11A2"
## V86  ""             "ITGB1"                   "SELL"
```

```
## V87  ""          "COL5A3"                "P2RY2"
## V88  ""          "RHOB"                  "ABCA1"
## V89  ""          "HTRA1"                 "FFAR2"
## V90  ""          "FGF2"                  "PROK2"
## V91  ""          "SNTB1"                 "GNAI3"
## V92  ""          "GADD45A"               "TACR1"
## V93  ""          "MEST"                  "SLC7A1"
## V94  ""          "LRRC15"                "CDKN1A"
## V95  ""          "TNFRSF11B"             "CYBB"
## V96  ""          "CD59"                  "TIMP1"
## V97  ""          "ACTA2"                 "HBEGF"
## V98  ""          "EFEMP2"                "SCARF1"
## V99  ""          "MATN2"                 "EBI3"
## V100 ""          "PCOLCE2"               "NFKBIA"
## V101 ""          "SERPINE2"              "SRI"
## V102 ""          "GPC1"                  "SLC7A2"
## V103 ""          "ABI3BP"                "CCL17"
## V104 ""          "FUCA1"                 "TLR3"
## V105 ""          "SLIT3"                 "APLNR"
## V106 ""          "LAMA1"                 "OSMR"
## V107 ""          "PMEPA1"                "IL10RA"
## V108 ""          "COL8A2"                "PSEN1"
## V109 ""          "FBN2"                  "GPR183"
## V110 ""          "IGFBP2"                "ATP2B1"
## V111 ""          "PFN2"                  "TNFRSF1B"
## V112 ""          "SDC4"                  "BEST1"
## V113 ""          "CD44"                  "GPC3"
## V114 ""          "GADD45B"               "SCN1B"
## V115 ""          "CXCL8"                 "ACVR1B"
## V116 ""          "GLIPR1"                "HPN"
## V117 ""          "ANPEP"                 "SEMA4D"
## V118 ""          "P3H1"                  "KLF6"
## V119 ""          "VEGFC"                 "CD48"
## V120 ""          "MMP14"                 "CXCR6"
## V121 ""          "SGCD"                  "SLC1A2"
## V122 ""          "PLOD1"                 "GP1BA"
## V123 ""          "MATN3"                 "TAPBP"
## V124 ""          "MYL9"                  "RGS16"
## V125 ""          "SLC6A8"                "SLAMF1"
## V126 ""          "CALU"                  "LCK"
## V127 ""          "PRRX1"                 "HIF1A"
## V128 ""          "TNFRSF12A"             "AHR"
## V129 ""          "FMOD"                  "NMI"
## V130 ""          "ID2"                   "RHOG"
## V131 ""          "GEM"                   "TPBG"
## V132 ""          "PLAUR"                 "NPFFR2"
## V133 ""          "MYLK"                  "IFNAR1"
## V134 ""          "TGFB1"                 "ICOSLG"
## V135 ""          "SFRP1"                 "RASGRP1"
## V136 ""          "PLOD3"                 "IFITM1"
## V137 ""          "IL6"                   "KCNJ2"
## V138 ""          "APLP1"                 "LY6E"
## V139 ""          "FBLN2"                 "IL18R1"
## V140 ""          "MSX1"                  "IL10"
```

```
## V141 ""            "PTX3"                "KCNA3"
## V142 ""            "FZD8"                "HAS2"
## V143 ""            "JUN"                 "DCBLD2"
## V144 ""            "FERMT2"              "LAMP3"
## V145 ""            "DKK1"                "VIP"
## V146 ""            "SNAI2"               "CD70"
## V147 ""            "DST"                 "RGS1"
## V148 ""            "TPM4"                "SLC31A1"
## V149 ""            "DCN"                 "ADRM1"
## V150 ""            "GJA1"                "KCNMB2"
## V151 ""            "PMP22"               "SERPINE1"
## V152 ""            "IGFBP4"              "MXD1"
## V153 ""            "COPA"                "AXL"
## V154 ""            "LRP1"                "MEFV"
## V155 ""            "ITGA2"               "PVR"
## V156 ""            "FLNA"                "CCL24"
## V157 ""            "MFAP5"               "PDE4B"
## V158 ""            "PTHLH"               "LCP2"
## V159 ""            "TGFBR3"              "PDPN"
## V160 ""            "SFRP4"               "IRF7"
## V161 ""            "LGALS1"              "MET"
## V162 ""            "RGS4"                "ATP2A2"
## V163 ""            "CDH6"                "SLC31A2"
## V164 ""            "SAT1"                "FZD5"
## V165 ""            "NT5E"                "ITGA5"
## V166 ""            "DPYSL3"              "SGMS2"
## V167 ""            "PPIB"                "MARCO"
## V168 ""            "TGM2"                "CD14"
## V169 ""            "SGCG"                "EIF2AK2"
## V170 ""            "ITGB3"               "ROS1"
## V171 ""            "PDLIM4"              "ATP2C1"
## V172 ""            "CTHRC1"              "NDP"
## V173 ""            "ECM2"                "BTG2"
## V174 ""            "CRLF1"               "MSR1"
## V175 ""            "AREG"                "PTPRE"
## V176 ""            "IL15"                "RNF144B"
## V177 ""            "MCM7"                "PCDH7"
## V178 ""            "GAS1"                "SPHK1"
## V179 ""            "PRSS2"               "IL18RAP"
## V180 ""            "CADM1"               "RTP4"
## V181 ""            "OXTR"                "RAF1"
## V182 ""            "SCG2"                "CHST2"
## V183 ""            "CXCL6"               "ITGB3"
## V184 ""            "MMP1"                "KIF1B"
## V185 ""            "TNFAIP3"             "SELE"
## V186 ""            "CAPG"                "NOD2"
## V187 ""            "CAP2"                "C5AR1"
## V188 ""            "MXRA5"               "EMP3"
## V189 ""            "FOXC2"               "CLEC5A"
## V190 ""            "NTM"                 "TACR3"
## V191 ""            "ENO2"                "SLC4A4"
## V192 ""            "FAS"                 "MEP1A"
## V193 ""            "BDNF"                "SELENOS"
## V194 ""            "ADAM12"              "LTA"
```

```
## V195 ""             "PVR"                            "PIK3R5"
## V196 ""             "CXCL12"                         "STAB1"
## V197 ""             "PDGFRB"                         "IRF1"
## V198 ""             "SLIT2"                          "ICAM4"
## V199 ""             "NOTCH2"                         "P2RX4"
## V200 ""             "COLGALT1"                       "ABI1"
## V201 ""             "GPX7"                           "CX3CL1"
## V202 ""             "WIPF1"                          "SLC28A2"
##      XENOBIOTIC_METABOLISM FATTY_ACID_METABOLISM OXIDATIVE_PHOSPHORYLATION
## V3   "CYP1A1"              "ACAA1"                "NDUFS3"
## V4   "FAH"                 "ACAA2"                "UQCRB"
## V5   "DCXR"                "ACADL"                "NDUFS2"
## V6   "CYP1A2"              "ACADM"                "SDHA"
## V7   "GSTA3"               "ACOT8"                "UQCRC1"
## V8   "CYP2J2"              "ACOX1"                "NDUFA9"
## V9   "CYP27A1"             "ACSL1"                "NDUFS4"
## V10  "ADH1C"               "ALDH3A2"              "NDUFS1"
## V11  "UGDH"                "CCDC58"               "NDUFA2"
## V12  "ASL"                 "CPT2"                 "NDUFS8"
## V13  "NQO1"                "CYP4A11"              "SDHB"
## V14  "ALAS1"               "DECR1"                "NNT"
## V15  "GSTM4"               "ECH1"                 "ATP5PO"
## V16  "CYP2C18"             "ECI1"                 "ATP5MC3"
## V17  "PTS"                 "ELOVL5"               "NDUFS7"
## V18  "CYB5A"               "FABP1"                "ATP5F1A"
## V19  "ACOX2"               "FABP2"                "NDUFV1"
## V20  "EPHX1"               "HADH"                 "COX5B"
## V21  "LCAT"                "HIBCH"                "UQCRH"
## V22  "SLC35D1"             "HMGCL"                "NDUFA1"
## V23  "GSS"                 "HSD17B11"             "ATP5F1C"
## V24  "FMO3"                "IDH1"                 "ATP5F1B"
## V25  "IDH1"                "ME1"                  "COX7B"
## V26  "AKR1C3"              "MGLL"                 "SDHD"
## V27  "SLC22A1"             "MLYCD"                "CYCS"
## V28  "GSTO1"               "PCBD1"                "NDUFA6"
## V29  "ARG1"                "RETSAT"               "NDUFAB1"
## V30  "CDO1"                "S100A10"              "COX8A"
## V31  "FMO1"                "SUCLG1"               "ACO2"
## V32  "ALDH9A1"             "VNN1"                 "ATP5MC1"
## V33  "POR"                 "EHHADH"               "CYC1"
## V34  "NDRG2"               "ALDH9A1"              "NDUFB6"
## V35  "UPB1"                "HADHB"                "ATP5F1E"
## V36  "ECH1"                "ECHS1"                "COX5A"
## V37  "PTGES"               "ACADS"                "UQCRC2"
## V38  "PDK4"                "CA2"                  "COX6A1"
## V39  "AHCY"                "HSD17B10"             "ATP5F1D"
## V40  "COMT"                "ALDH1A1"              "COX6C"
## V41  "AOX1"                "ACADVL"               "ATP5PF"
## V42  "CFB"                 "HSD17B4"              "NDUFB3"
## V43  "DDAH2"               "CA4"                  "IDH3B"
## V44  "HGFAC"               "ADH1C"                "OGDH"
## V45  "F11"                 "ADH7"                 "NDUFB8"
## V46  "CYP26A1"             "PTS"                  "SURF1"
## V47  "MCCC2"               "MAOA"                 "COX6B1"
```

```
## V48  "SERPINA6"          "HAO2"              "NDUFB5"
## V49  "GNMT"              "HSD17B7"           "NDUFA4"
## V50  "BLVRB"             "MCEE"              "NDUFB1"
## V51  "HACL1"             "ACAT2"             "COX4I1"
## V52  "MAOA"              "AUH"               "COX7C"
## V53  "KYNU"              "HPGD"              "UQCRFS1"
## V54  "DHPS"              "FH"                "SDHC"
## V55  "SERPINE1"          "HMGCS2"            "ATP6V1F"
## V56  "SLC6A12"           "ALAD"              "COX7A2"
## V57  "GCH1"              "GPD1"              "SUCLG1"
## V58  "DHRS7"             "ACO2"              "NDUFS6"
## V59  "PAPSS2"            "CBR1"              "NDUFA7"
## V60  "ALDH2"             "GRHPR"             "FH"
## V61  "HSD11B1"           "ACOT2"             "NDUFV2"
## V62  "SLC35B1"           "GOS2"              "OXA1L"
## V63  "KARS1"             "MDH2"              "NDUFC1"
## V64  "CA2"               "HSP90AA1"          "UQCR11"
## V65  "LPIN2"             "BCKDHB"            "NDUFA5"
## V66  "CAT"               "UROS"              "CS"
## V67  "CYP2S1"            "YWHAH"             "ATP6V1G1"
## V68  "RAP1GAP"           "LDHA"              "ATP5PB"
## V69  "FBP1"              "CRYZ"              "HCCS"
## V70  "RBP4"              "RDH16"             "HADHB"
## V71  "GCKR"              "INMT"              "ATP5PD"
## V72  "CDA"               "UGDH"              "PDHA1"
## V73  "MTHFD1"            "GSTZ1"             "NDUFA8"
## V74  "ADH7"              "IDH3B"             "DLD"
## V75  "DHRS1"             "MDH1"              "OPA1"
## V76  "VNN1"              "CRAT"              "SLC25A11"
## V77  "CNDP2"             "ETFDH"             "ATP5ME"
## V78  "SLC6A6"            "CD36"              "PDHB"
## V79  "FETUB"             "ECI2"              "ATP5MF"
## V80  "CROT"              "SDHD"              "NDUFB7"
## V81  "GAD1"              "ACSL5"             "IDH2"
## V82  "AKR1C2"            "HSDL2"             "MTX2"
## V83  "TKFC"              "HMGCS1"            "VDAC3"
## V84  "IGF1"              "SDHC"              "MDH1"
## V85  "SSR3"              "CD1D"              "ATP5MC2"
## V86  "GABARAPL1"         "GCDH"              "IMMT"
## V87  "TMBIM6"            "GPD2"              "MDH2"
## V88  "CD36"              "ALDH3A1"           "SLC25A3"
## V89  "CES1"              "SLC22A5"           "ATP6V1D"
## V90  "SHMT2"             "PDHB"              "VDAC2"
## V91  "TMEM176B"          "TDO2"              "ACADM"
## V92  "GSTT2"             "FASN"              "COX7A2L"
## V93  "PLG"               "NBN"               "TIMM17A"
## V94  "HMOX1"             "PSME1"             "ATP6V1E1"
## V95  "SPINT2"            "PPARA"             "NDUFA3"
## V96  "ALDH3A1"           "NCAPH2"            "SLC25A6"
## V97  "GSR"               "BPHL"              "IDH3G"
## V98  "ABHD6"             "ODC1"              "ACADVL"
## V99  "XDH"               "CA6"               "ETFA"
## V100 "PPARD"             "DLD"               "TIMM9"
## V101 "ELOVL5"            "HCCS"              "IDH3A"
```

```
## V102 "CYP4F2"            "EPHX1"             "TIMM8B"
## V103 "RETSAT"            "DLST"              "ATP6AP1"
## V104 "CYFIP2"            "FMO1"              "TIMM13"
## V105 "PINK1"             "AOC3"              "UQCRQ"
## V106 "GCLC"              "UROD"              "ABCB7"
## V107 "ESR1"              "CPT1A"             "VDAC1"
## V108 "PMM1"              "KMT5A"             "ATP5MG"
## V109 "TDO2"              "UBE2L6"            "PHB2"
## V110 "MT2A"              "MIF"               "DECR1"
## V111 "ATP2A2"            "SUCLG2"            "SUCLA2"
## V112 "DDT"               "CPOX"              "GOT2"
## V113 "FABP1"             "SMS"               "DLAT"
## V114 "ACP2"              "CBR3"              "ATP6V1H"
## V115 "ABCD2"             "NTHL1"             "NDUFB2"
## V116 "G6PC"              "CIDEA"             "FDX1"
## V117 "DDC"               "IDI1"              "HADHA"
## V118 "ACOX3"             "AADAT"             "ATP6V1C1"
## V119 "SAR1B"             "REEP6"             "MAOB"
## V120 "FBLN1"             "HSPH1"             "NDUFB4"
## V121 "ADH5"              "APEX1"             "UQCR10"
## V122 "CRP"               "NSDHL"             "ETFDH"
## V123 "ABCC2"             "ADIPOR2"           "GPX4"
## V124 "ETS2"              "ACSL4"             "PDHX"
## V125 "NPC1"              "ACSS1"             "MFN2"
## V126 "CASP6"             "ENO3"              "AIFM1"
## V127 "BPHL"              "IDH3G"             "ACAA2"
## V128 "IL1R1"             "LGALS1"            "ETFB"
## V129 "ENTPD5"            "METAP1"            "COX11"
## V130 "TNFRSF1A"          "ALDOA"             "ECHS1"
## V131 "IGFBP4"            "ACSM3"             "PMPCA"
## V132 "PYCR1"             "LTC4S"             "ATP6V0B"
## V133 "CSAD"              "D2HGDH"            "SLC25A5"
## V134 "VTN"               "ADSL"              "DLST"
## V135 "ID2"               "SUCLA2"            "COX15"
## V136 "ETFDH"             "SDHA"              "CYB5A"
## V137 "HRG"               "XIST"              "ALAS1"
## V138 "TYR"               "OSTC"              "SLC25A4"
## V139 "UPP1"              "GLUL"              "CPT1A"
## V140 "BCAR1"             "CYP4A22"           "SLC25A20"
## V141 "CBR1"              "GABARAPL1"         "MTRR"
## V142 "APOE"              "AQP7"              "COX17"
## V143 "SLC12A4"           "CYP1A1"            "CYB5R3"
## V144 "TMEM97"            "PRDX6"             "TOMM22"
## V145 "SLC46A3"           "ERP29"             "ACAT1"
## V146 "PTGDS"             "H2AZ1"             "MRPS11"
## V147 "MPP2"              "GAPDHS"            "ATP6V0C"
## V148 "PTGR1"             "DHCR24"            "PDK4"
## V149 "AQP9"              "GAD2"              "TIMM10"
## V150 "EPHA2"             "PTPRG"             "LDHA"
## V151 "PSMB10"            "IL4I1"             "ECI1"
## V152 "FAS"               "TP53INP2"          "MRPL11"
## V153 "ACOX1"             "PDHA1"             "FXN"
## V154 "GART"              "RAP1GDS1"          "MRPS12"
## V155 "HPRT1"             "CEL"               "COX10"
```

```
## V156 "PGD"                "BLVRA"              "RHOT1"
## V157 "ABCC3"              "SERINC1"            "ACAA1"
## V158 "SMOX"               "BMPR1B"             "ACADSB"
## V159 "TTPA"               "RDH11"              "LDHB"
## V160 "HES6"               "ENO2"               "MRPS30"
## V161 "GCNT2"              ""                   "ATP1B1"
## V162 "MAN1A1"             ""                   "BDH2"
## V163 "IGFBP1"             ""                   "SLC25A12"
## V164 "ITIH4"              ""                   "TIMM50"
## V165 "PROS1"              ""                   "MRPL34"
## V166 "TPST1"              ""                   "ISCA1"
## V167 "LEAP2"              ""                   "MRPL35"
## V168 "NFS1"               ""                   "IDH1"
## V169 "PGRMC1"             ""                   "HSPA9"
## V170 "CYP17A1"            ""                   "MRPL15"
## V171 "ARPP19"             ""                   "MRPS15"
## V172 "SERTAD1"            ""                   "TOMM70"
## V173 "ARG2"               ""                   "TCIRG1"
## V174 "HNF4A"              ""                   "ISCU"
## V175 "REG1A"              ""                   "POLR2F"
## V176 "CCL25"              ""                   "NQO2"
## V177 "PEMT"               ""                   "NDUFC2"
## V178 "ACO2"               ""                   "MRPS22"
## V179 "LONP1"              ""                   "POR"
## V180 "NMT1"               ""                   "ATP6V0E1"
## V181 "PTGES3"             ""                   "PHYH"
## V182 "F10"                ""                   "MPC1"
## V183 "TAT"                ""                   "GPI"
## V184 "MARCHF6"            ""                   "AFG3L2"
## V185 "JUP"                ""                   "HSD17B10"
## V186 "ACP1"               ""                   "CASP7"
## V187 "MBL2"               ""                   "PRDX3"
## V188 "TGFB2"              ""                   "MGST3"
## V189 "ENPEP"              ""                   "HTRA2"
## V190 "HSD17B2"            ""                   "BCKDHA"
## V191 "ANGPTL3"            ""                   "LRPPRC"
## V192 "PC"                 ""                   "RETSAT"
## V193 "PDLIM5"             ""                   "ECH1"
## V194 "CYP2E1"             ""                   "RHOT2"
## V195 "BCAT1"              ""                   "BAX"
## V196 "ATOH8"              ""                   "MTRF1"
## V197 "SLC1A5"             ""                   "GLUD1"
## V198 "IRF8"               ""                   "SUPV3L1"
## V199 "NINJ1"              ""                   "GRPEL1"
## V200 "AP4B1"              ""                   "PDP1"
## V201 "ACSM1"              ""                   "ALDH6A1"
## V202 "ITIH1"              ""                   "OAT"
##      GLYCOLYSIS REACTIVE_OXYGEN_SPECIES_PATHWAY P53_PATHWAY UV_RESPONSE_UP
## V3   "PGK1"     "GSR"                          "CDKN1A"    "NXF1"
## V4   "ALDOA"    "PRDX2"                        "BTG2"      "SLC6A8"
## V5   "ENO1"     "TXNRD1"                       "MDM2"      "BAK1"
## V6   "TPI1"     "SOD1"                         "CCNG1"     "CDC5L"
## V7   "PFKP"     "GCLC"                         "FAS"       "HSPA2"
## V8   "ERO1A"    "CAT"                          "TOB1"      "POLR2H"
```

```
## V9   "ALDOB"     "GPX4"                "GADD45A"   "ALAS1"
## V10  "VEGFA"     "MPO"                 "PHLDA3"    "TUBA4A"
## V11  "MXI1"      "PRDX1"               "TAP1"      "C4BPB"
## V12  "PKM"       "PRDX6"               "CDKN2B"    "CCNE1"
## V13  "HK2"       "GCLM"                "SFN"       "EPHX1"
## V14  "LDHA"      "TXN"                 "ZMAT3"     "GRPEL1"
## V15  "EXT1"      "SOD2"                "DDB2"      "ICAM1"
## V16  "SLC25A10"  "PRDX4"               "EI24"      "FEN1"
## V17  "GUSB"      "SELENOS"             "PERP"      "ARRB2"
## V18  "PFKFB1"    "PDLIM1"              "DDIT4"     "JUNB"
## V19  "PGAM1"     "TXNRD2"              "ATF3"      "CTSV"
## V20  "PYGB"      "LAMTOR5"             "BAX"       "DGAT1"
## V21  "AK4"       "G6PD"                "SESN1"     "ATF3"
## V22  "P4HA1"     "MSRA"                "FDXR"      "CASP3"
## V23  "PMM2"      "MBP"                 "PIDD1"     "RASGRP1"
## V24  "FAM162A"   "SRXN1"               "SAT1"      "TMBIM6"
## V25  "SDC1"      "NQO1"                "CDKN2A"    "FOS"
## V26  "EGLN3"     "OXSR1"               "AEN"       "TAP1"
## V27  "PC"        "GLRX2"               "PPM1D"     "E2F5"
## V28  "B4GALT7"   "HMOX2"               "FOXO3"     "RAB27A"
## V29  "FBP2"      "FES"                 "BTG1"      "CCND3"
## V30  "IGFBP3"    "PFKP"                "TXNIP"     "SLC25A4"
## V31  "CHPF"      "NDUFB4"              "SLC19A2"   "SPR"
## V32  "B3GAT3"    "GPX3"                "IER3"      "CDKN2B"
## V33  "CHST12"    "SCAF4"               "TP53"      "SHOX2"
## V34  "HS2ST1"    "CDKN2D"              "NOTCH1"    "OLFM1"
## V35  "MPI"       "MGST1"               "RRAD"      "IGFBP2"
## V36  "GNPDA1"    "ABCC1"               "DCXR"      "LYN"
## V37  "AKR1A1"    "FTL"                 "NINJ1"     "CLTB"
## V38  "PPFIA4"    "ATOX1"               "FOS"       "BCL2L11"
## V39  "B3GAT1"    "STK25"               "S100A10"   "LHX2"
## V40  "CHPF2"     "EGLN2"               "FBXW7"     "NFKBIA"
## V41  "G6PD"      "ERCC2"               "PLK3"      "MSX1"
## V42  "MDH2"      "SBNO2"               "XPC"       "H2AX"
## V43  "CHST6"     "JUNB"                "AK1"       "NR4A1"
## V44  "PGLS"      "PTPA"                "TRIAP1"    "GLS"
## V45  "PGAM2"     "LSP1"                "BAK1"      "CDC34"
## V46  "CHST1"     "NDUFA6"              "CCND2"     "MMP14"
## V47  "GPC1"      "HHEX"                "APAF1"     "STK25"
## V48  "TSTA3"     "GLRX"                "PDGFA"     "PDAP1"
## V49  "ALG1"      "NDUFS2"              "NDRG1"     "ABCB1"
## V50  "GFPT1"     "PRNP"                "RALGDS"    "BSG"
## V51  "PRPS1"     "IPCEF1"              "SERPINB5"  "SELENOW"
## V52  "GOT1"      ""                    "DGKA"      "IRF1"
## V53  "MDH1"      ""                    "CYFIP2"    "RXRB"
## V54  "SLC35A3"   ""                    "KLF4"      "TFRC"
## V55  "GALK1"     ""                    "IP6K2"     "PPIF"
## V56  "EGFR"      ""                    "ADA"       "CDKN1C"
## V57  "ANGPTL4"   ""                    "TNFSF9"    "HLA-F"
## V58  "CITED2"    ""                    "KLK8"      "CREG1"
## V59  "PLOD2"     ""                    "PRKAB1"    "APOM"
## V60  "QSOX1"     ""                    "STOM"      "BMP2"
## V61  "ME2"       ""                    "SOCS1"     "TGFBRAP1"
## V62  "SPAG4"     ""                    "PLK2"      "NAT1"
```

```
## V63  "P4HA2"     ""                "CASP1"     "CYB5R1"
## V64  "GAPDHS"    ""                "RCHY1"     "RRAD"
## V65  "ENO2"      ""                "PCNA"      "POLE3"
## V66  "GOT2"      ""                "RPS27L"    "IL6"
## V67  "EXT2"      ""                "RB1"       "YKT6"
## V68  "SLC25A13"  ""                "PPP1R15A"  "ACAA1"
## V69  "HMMR"      ""                "POLH"      "CLCN2"
## V70  "PDK3"      ""                "RAB40C"    "AGO2"
## V71  "CXCR4"     ""                "ERCC5"     "SOD2"
## V72  "GPC4"      ""                "CDH13"     "PPP1R2"
## V73  "ECD"       ""                "DDIT3"     "RHOB"
## V74  "GNE"       ""                "TGFB1"     "RET"
## V75  "B4GALT2"   ""                "FUCA1"     "PDLIM3"
## V76  "FUT8"      ""                "H2AW"      "EPCAM"
## V77  "MIOX"      ""                "TP63"      "DNAJA1"
## V78  "VCAN"      ""                "HSPA4L"    "SULT1A1"
## V79  "GPC3"      ""                "EPHX1"     "CHKA"
## V80  "B3GALT6"   ""                "ABHD4"     "CYP1A1"
## V81  "HSPA5"     ""                "H2AJ"      "ATP6V1F"
## V82  "ME1"       ""                "TRAF4"     "CDO1"
## V83  "ADORA2B"   ""                "CTSF"      "ALDOA"
## V84  "UGP2"      ""                "IER5"      "NPTXR"
## V85  "MIF"       ""                "TAX1BP3"   "EIF2S3"
## V86  "NANP"      ""                "TSC22D1"   "CNP"
## V87  "ZNF292"    ""                "RGS16"     "GRINA"
## V88  "STC2"      ""                "HRAS"      "BID"
## V89  "TPST1"     ""                "PVT1"      "POLG2"
## V90  "PGM2"      ""                "ZFP36L1"   "IL6ST"
## V91  "GYS1"      ""                "SDC1"      "HYAL2"
## V92  "TKTL1"     ""                "WRAP73"    "FOSB"
## V93  "TGFA"      ""                "RAP2B"     "MGAT1"
## V94  "CHST2"     ""                "COQ8A"     "NKX2-5"
## V95  "PHKA2"     ""                "PLXNB2"    "PPAT"
## V96  "STMN1"     ""                "HEXIM1"    "FURIN"
## V97  "GALE"      ""                "PROCR"     "MRPL23"
## V98  "MET"       ""                "SPHK1"     "HTR7"
## V99  "LCT"       ""                "NOL8"      "CXCL2"
## V100 "IRS2"      ""                "DEF6"      "KLHDC3"
## V101 "POLR3K"    ""                "SP1"       "PRPF3"
## V102 "B4GALT1"   ""                "JAG2"      "DNAJB1"
## V103 "EFNA3"     ""                "CCP110"    "AP2S1"
## V104 "LHX9"      ""                "DRAM1"     "PSMC3"
## V105 "KDELR3"    ""                "RPL18"     "TST"
## V106 "TALDO1"    ""                "CEBPA"     "SIGMAR1"
## V107 "DPYSL4"    ""                "KIF13B"    "GCH1"
## V108 "VLDLR"     ""                "MXD1"      "BTG2"
## V109 "CD44"      ""                "TRAFD1"    "CEBPG"
## V110 "AGL"       ""                "OSGIN1"    "TARS1"
## V111 "SOX9"      ""                "ANKRA2"    "UROD"
## V112 "DDIT4"     ""                "HBEGF"     "PARP2"
## V113 "IDUA"      ""                "RAD51C"    "BTG3"
## V114 "CASP6"     ""                "ITGB4"     "DLG4"
## V115 "GLCE"      ""                "TRIB3"     "CHRNA5"
## V116 "COPB2"     ""                "INHBB"     "NPTX2"
```

```
## V117 "DSC2"     ""
## V118 "HS6ST2"   ""
## V119 "CDK1"     ""
## V120 "PLOD1"    ""
## V121 "SDC2"     ""
## V122 "GMPPB"    ""
## V123 "PAXIP1"   ""
## V124 "NSDHL"    ""
## V125 "RARS1"    ""
## V126 "SLC16A3"  ""
## V127 "GLRX"     ""
## V128 "SRD5A3"   ""
## V129 "SDC3"     ""
## V130 "HDLBP"    ""
## V131 "COL5A1"   ""
## V132 "CLDN9"    ""
## V133 "TFF3"     ""
## V134 "STC1"     ""
## V135 "KIF20A"   ""
## V136 "GYS2"     ""
## V137 "SLC37A4"  ""
## V138 "LHPP"     ""
## V139 "SDHC"     ""
## V140 "NASP"     ""
## V141 "AURKA"    ""
## V142 "B3GNT3"   ""
## V143 "ISG20"    ""
## V144 "LDHC"     ""
## V145 "ARPP19"   ""
## V146 "CENPA"    ""
## V147 "HOMER1"   ""
## V148 "BIK"      ""
## V149 "CYB5A"    ""
## V150 "HAX1"     ""
## V151 "COG2"     ""
## V152 "IL13RA1"  ""
## V153 "NOL3"     ""
## V154 "CLDN3"    ""
## V155 "AGRN"     ""
## V156 "CLN6"     ""
## V157 "TXN"      ""
## V158 "PAM"      ""
## V159 "CAPN5"    ""
## V160 "PKP2"     ""
## V161 "ABCB6"    ""
## V162 "DCN"      ""
## V163 "GMPPA"    ""
## V164 "BPNT1"    ""
## V165 "ANG"      ""
## V166 "GPR87"    ""
## V167 "GAL3ST1"  ""
## V168 "ALDH7A1"  ""
## V169 "NT5E"     ""
## V170 "IDH1"     ""
```

```
"VAMP8"     "ATP6V1C1"
"VWA5A"     "AQP3"
"ABAT"      "PLCL1"
"CTSD"      "NUP58"
"PTPRE"     "TYRO3"
"HINT1"     "HMOX1"
"ALOX15B"   "RPN1"
"VDR"       "BTG1"
"ELP1"      "FMO1"
"WWP1"      "ASNS"
"NUPR1"     "DDX21"
"TCN2"      "KCNH2"
"CDKN2AIP"  "COL2A1"
"POM121"    "MAOA"
"ZNF365"    "TCHH"
"EPHA2"     "CYB5B"
"JUN"       "HSPA13"
"MAPKAPK3"  "GGH"
"SLC7A11"   "GAL"
"SERTAD3"   "NTRK3"
"IRAK1"     "PPT1"
"ABCC5"     "FGF18"
"UPP1"      "FKBP4"
"CD81"      "STIP1"
"LIF"       "EIF5"
"RPL36"     "ENO2"
"FAM162A"   "GPX3"
"RNF19B"    "PRKACA"
"CDK5R1"    "PRKCD"
"STEAP3"    "STARD3"
"PITPNC1"   "MARK2"
"SLC35D1"   "SLC6A12"
"TPRKB"     "SQSTM1"
"RRP8"      "PTPRD"
"IL1A"      "MAPK8IP2"
"PMM1"      "CDK2"
"TPD52L1"   "ONECUT1"
"IFI30"     "RFC4"
"GM2A"      "CA2"
"RPS12"     "TACR3"
"EPS8L2"    "AMD1"
"TM4SF1"    "HNRNPU"
"BLCAP"     "WIZ"
"MKNK2"     "CCK"
"CD82"      ""
"RACK1"     ""
"ST14"      ""
"TCHH"      ""
"HDAC3"     ""
"CCNK"      ""
"RHBDF2"    ""
"NUDT15"    ""
"TGFA"      ""
"ISCU"      ""
```

```
## V171 "PYGL"     ""                                  "LDHB"      ""
## V172 "NDUFV3"   ""                                  "TNNI1"     ""
## V173 "NDST3"    ""                                  "FGF13"     ""
## V174 "PPP2CB"   ""                                  "RXRA"      ""
## V175 "PSMC4"    ""                                  "APP"       ""
## V176 "TPBG"     ""                                  "F2R"       ""
## V177 "TGFBI"    ""                                  "CLCA2"     ""
## V178 "GALK2"    ""                                  "CGRRF1"    ""
## V179 "CTH"      ""                                  "CSRNP2"    ""
## V180 "KIF2A"    ""                                  "ACVR1B"    ""
## V181 "CACNA1H"  ""                                  "BMP2"      ""
## V182 "ANKZF1"   ""                                  "GPX2"      ""
## V183 "SAP30"    ""                                  "KRT17"     ""
## V184 "RBCK1"    ""                                  "TM7SF3"    ""
## V185 "ELF3"     ""                                  "ZBTB16"    ""
## V186 "RPE"      ""                                  "PTPN14"    ""
## V187 "B4GALT4"  ""                                  "TSPYL2"    ""
## V188 "DEPDC1"   ""                                  "SLC3A2"    ""
## V189 "RRAGD"    ""                                  "S100A4"    ""
## V190 "IER3"     ""                                  "GLS2"      ""
## V191 "ALDH9A1"  ""                                  "CCND3"     ""
## V192 "DLD"      ""                                  "PRMT2"     ""
## V193 "MERTK"    ""                                  "NHLH2"     ""
## V194 "GCLC"     ""                                  "BAIAP2"    ""
## V195 "FKBP4"    ""                                  "RETSAT"    ""
## V196 "SOD1"     ""                                  "IRAG2"     ""
## V197 "MED24"    ""                                  "H1-2"      ""
## V198 "AK3"      ""                                  "DNTTIP2"   ""
## V199 "XYLT2"    ""                                  "MXD4"      ""
## V200 "ARTN"     ""                                  "SEC61A1"   ""
## V201 "PPIA"     ""                                  "HMOX1"     ""
## V202 "CHST4"    ""                                  "RAD9A"     ""
##      UV_RESPONSE_DN ANGIOGENESIS HEME_METABOLISM COAGULATION
## V3   "TJP1"         "VCAN"       "ALAS2"         "F2"
## V4   "NFIB"         "POSTN"      "PPOX"          "PROC"
## V5   "TGFBR3"       "FSTL1"      "FECH"          "C1S"
## V6   "TFPI"         "LRPAP1"     "HMBS"          "MMP14"
## V7   "MMP16"        "STC1"       "GYPB"          "F10"
## V8   "ABCC1"        "LPL"        "ALAD"          "PLG"
## V9   "MAP2K5"       "VEGFA"      "RHD"           "C1R"
## V10  "AGGF1"        "PF4"        "GYPA"          "SERPINE1"
## V11  "PLCB4"        "THBD"       "SELENBP1"      "SERPING1"
## V12  "MET"          "FGFR1"      "BLVRB"         "C2"
## V13  "IRS1"         "TNFRSF21"   "GYPE"          "F12"
## V14  "PTPRM"        "CCND2"      "GYPC"          "CFI"
## V15  "AKT3"         "COL5A2"     "EPB42"         "MMP2"
## V16  "SIPA1L1"      "ITGAV"      "SLC4A1"        "C3"
## V17  "NR1D2"        "SERPINA5"   "RHCE"          "F9"
## V18  "ATRN"         "KCNJ8"      "RHAG"          "CTSO"
## V19  "ANXA2"        "APP"        "TAL1"          "TMPRSS6"
## V20  "ADD3"         "JAG1"       "MARCHF8"       "MMP9"
## V21  "CDKN1B"       "COL3A1"     "SPTB"          "PROZ"
## V22  "ATXN1"        "SPP1"       "UROD"          "MMP1"
## V23  "CAP2"         "NRP1"       "HBQ1"          "CFB"
```

```
## V24  "PRDM2"        "OLR1"       "DCAF11"        "BMP1"
## V25  "TOGARAM1"     "PDGFA"      "ERMAP"         "VWF"
## V26  "SDC2"         "PTK2"       "EIF2AK1"       "FGA"
## V27  "SMAD3"        "SLCO2A1"    "CPOX"          "F11"
## V28  "SLC7A1"       "PGLYRP1"    "MPP1"          "THBD"
## V29  "GCNT1"        "VAV2"       "GLRX5"         "FURIN"
## V30  "RUNX1"        "S100A4"     "TSPAN5"        "MMP11"
## V31  "RND3"         "MSX1"       "OSBP2"         "F8"
## V32  "PLPP3"        "VTN"        "ANK1"          "LGMN"
## V33  "NR3C1"        "TIMP1"      "NFE2"          "HPN"
## V34  "YTHDC1"       "APOH"       "AHSP"          "CTSB"
## V35  "PPARG"        "PRG2"       "SPTA1"         "MBL2"
## V36  "ADGRL2"       "JAG2"       "MAP2K3"        "F13B"
## V37  "DLG1"         "LUM"        "BNIP3L"        "TIMP1"
## V38  "ATP2B4"       "CXCL6"      "SLC22A4"       "CTSV"
## V39  "NIPBL"        ""           "CLIC2"         "MMP8"
## V40  "PEX14"        ""           "TRAK2"         "A2M"
## V41  "MYC"          ""           "GCLC"          "MMP10"
## V42  "RASA2"        ""           "KEL"           "MASP2"
## V43  "FZD2"         ""           "RANBP10"       "FGG"
## V44  "BMPR1A"       ""           "TRIM10"        "C8A"
## V45  "LPAR1"        ""           "TSPO2"         "PLAU"
## V46  "PRKCA"        ""           "UROS"          "ADAM9"
## V47  "MGMT"         ""           "XK"            "GSN"
## V48  "PRKCE"        ""           "SNCA"          "CAPN2"
## V49  "RXRA"         ""           "MARK3"         "PLAT"
## V50  "LTBP1"        ""           "UBAC1"         "FN1"
## V51  "LDLR"         ""           "CA1"           "CTSH"
## V52  "RBPMS"        ""           "CA2"           "OLR1"
## V53  "CACNA1A"      ""           "BSG"           "SPARC"
## V54  "RGS4"         ""           "FOXO3"         "RGN"
## V55  "COL5A2"       ""           "KLF1"          "C8B"
## V56  "PTPN21"       ""           "CDC27"         "LAMP2"
## V57  "PRKAR2B"      ""           "KAT2B"         "C9"
## V58  "GJA1"         ""           "NARF"          "PROS1"
## V59  "BCKDHB"       ""           "GCLM"          "CLU"
## V60  "DMAC2L"       ""           "FBXO7"         "F2RL2"
## V61  "SERPINE1"     ""           "H1-0"          "CD9"
## V62  "AMPH"         ""           "HEBP1"         "CFH"
## V63  "MIOS"         ""           "HBD"           "PREP"
## V64  "CITED2"       ""           "NUDT4"         "LTA4H"
## V65  "COL1A2"       ""           "FBXO9"         "GP9"
## V66  "INSIG1"       ""           "RAD23A"        "DUSP14"
## V67  "FYN"          ""           "CROCCP2"       "CTSK"
## V68  "WDR37"        ""           "TMCC2"         "GDA"
## V69  "ZMIZ1"        ""           "BLVRA"         "CASP9"
## V70  "PMP22"        ""           "GATA1"         "APOC1"
## V71  "CDON"         ""           "RBM38"         "CRIP2"
## V72  "PIK3R3"       ""           "PRDX2"         "KLK8"
## V73  "NOTCH2"       ""           "RNF123"        "SERPINC1"
## V74  "SYNJ2"        ""           "MINPP1"        "ANXA1"
## V75  "SMAD7"        ""           "TNS1"          "ITIH1"
## V76  "MAP1B"        ""           "CTSE"          "PRSS23"
## V77  "TENT4A"       ""           "DMTN"          "FBN1"
```

```
## V78  "PTEN"        ""          "HDGF"         "MST1"
## V79  "DYRK1A"      ""          "XPO7"         "F3"
## V80  "NEK7"        ""          "MKRN1"        "KLF7"
## V81  "SPOP"        ""          "SMOX"         "CTSE"
## V82  "F3"          ""          "TFDP2"        "ITGB3"
## V83  "ERBB2"       ""          "MXI1"         "CAPN5"
## V84  "GRK5"        ""          "HBB"          "CSRP1"
## V85  "DUSP1"       ""          "MOSPD1"       "KLKB1"
## V86  "VLDLR"       ""          "SLC25A37"     "MSRB2"
## V87  "CAV1"        ""          "SLC30A1"      "TFPI2"
## V88  "COL11A1"     ""          "ABCB6"        "MMP3"
## V89  "CDC42BPA"    ""          "SLC6A8"       "MEP1A"
## V90  "CDK13"       ""          "TFRC"         "GP1BA"
## V91  "SFMBT1"      ""          "RCL1"         "APOA1"
## V92  "ADORA2B"     ""          "TOP1"         "SERPINA1"
## V93  "BHLHE40"     ""          "EPOR"         "TF"
## V94  "COL3A1"      ""          "TNRC6B"       "PEF1"
## V95  "KCNMA1"      ""          "ACSL6"        "GNG12"
## V96  "SYNE1"       ""          "GAPVD1"       "SIRT2"
## V97  "IGF1R"       ""          "MGST3"        "COMP"
## V98  "CELF2"       ""          "SLC30A10"     "HTRA1"
## V99  "MTA1"        ""          "CAT"          "MAFF"
## V100 "EFEMP1"      ""          "BCAM"         "LRP1"
## V101 "LAMC1"       ""          "HBZ"          "PF4"
## V102 "PHF3"        ""          "ACKR1"        "CPQ"
## V103 "SCAF8"       ""          "PSMD9"        "MMP15"
## V104 "VAV2"        ""          "ISCA1"        "RABIF"
## V105 "PIAS3"       ""          "PDZK1IP1"     "HRG"
## V106 "ACVR2A"      ""          "H4C3"         "C8G"
## V107 "NRP1"        ""          "ICAM4"        "APOC2"
## V108 "MRPS31"      ""          "MOCOS"        "SERPINB2"
## V109 "CCN1"        ""          "ADD1"         "RAPGEF3"
## V110 "DAB2"        ""          "FTCD"         "CPN1"
## V111 "MAGI2"       ""          "ADD2"         "ITGA2"
## V112 "ANXA4"       ""          "BMP2K"        "RAC1"
## V113 "COL1A1"      ""          "BPGM"         "DPP4"
## V114 "SCHIP1"      ""          "CLCN3"        "WDR1"
## V115 "DDAH1"       ""          "E2F2"         "THBS1"
## V116 "PDGFRB"      ""          "HAGH"         "FYN"
## V117 "ATRX"        ""          "KDM7A"        "PDGFB"
## V118 "KALRN"       ""          "OPTN"         "SH2B2"
## V119 "TGFBR2"      ""          "RAP1GAP"      "PECAM1"
## V120 "PTGFR"       ""          "CTNS"         "MMP7"
## V121 "ATP2C1"      ""          "NFE2L1"       "DUSP6"
## V122 "ARHGEF9"     ""          "ELL2"         "CPB2"
## V123 "NFKB1"       ""          "SLC2A1"       "S100A13"
## V124 "MGLL"        ""          "PIGQ"         "CFD"
## V125 "FBLN5"       ""          "KLF3"         "DCT"
## V126 "PDLIM5"      ""          "EPB41"        "LEFTY2"
## V127 "MAPK14"      ""          "LAMP2"        "ANG"
## V128 "SRI"         ""          "TMEM9B"       "C1QA"
## V129 "INPP4B"      ""          "EZH1"         "HMGCS2"
## V130 "IGFBP5"      ""          "CTSB"         "ISCU"
## V131 "ITGB3"       ""          "ATG4A"        "PLEK"
```

```
## V132 "BDNF"        ""          "MFHAS1"       "APOC3"
## V133 "ID1"         ""          "MYL4"         "P2RY1"
## V134 "SNAI2"       ""          "RNF19A"       "USP11"
## V135 "SCN8A"       ""          "BTG2"         "TIMP3"
## V136 "ATP2B1"      ""          "SLC11A2"      "ACOX2"
## V137 "FHL2"        ""          "ADIPOR1"      "HNF4A"
## V138 "KIT"         ""          "ASNS"         "S100A1"
## V139 "APBB2"       ""          "DCUN1D1"      "GNB2"
## V140 "PIK3CD"      ""          "ALDH1L1"      "ARF4"
## V141 "DLC1"        ""          "DCAF10"       ""
## V142 "MT1E"        ""          "YPEL5"        ""
## V143 "DBP"         ""          "SEC14L1"      ""
## V144 "HAS2"        ""          "USP15"        ""
## V145 "SLC22A18"    ""          "RIOK3"        ""
## V146 "ICA1"        ""          "SIDT2"        ""
## V147 ""            ""          "FOXJ2"        ""
## V148 ""            ""          "TCEA1"        ""
## V149 ""            ""          "VEZF1"        ""
## V150 ""            ""          "LPIN2"        ""
## V151 ""            ""          "PC"           ""
## V152 ""            ""          "HBBP1"        ""
## V153 ""            ""          "CDR2"         ""
## V154 ""            ""          "CCND3"        ""
## V155 ""            ""          "SLC25A38"     ""
## V156 ""            ""          "TENT5C"       ""
## V157 ""            ""          "FBXO34"       ""
## V158 ""            ""          "BACH1"        ""
## V159 ""            ""          "NR3C1"        ""
## V160 ""            ""          "AQP3"         ""
## V161 ""            ""          "TRIM58"       ""
## V162 ""            ""          "LMO2"         ""
## V163 ""            ""          "PICALM"       ""
## V164 ""            ""          "NCOA4"        ""
## V165 ""            ""          "GDE1"         ""
## V166 ""            ""          "SLC6A9"       ""
## V167 ""            ""          "NNT"          ""
## V168 ""            ""          "ARHGEF12"     ""
## V169 ""            ""          "PPP2R5B"      ""
## V170 ""            ""          "C3"           ""
## V171 ""            ""          "MARCHF2"      ""
## V172 ""            ""          "UCP2"         ""
## V173 ""            ""          "SYNJ1"        ""
## V174 ""            ""          "FN3K"         ""
## V175 ""            ""          "ABCG2"        ""
## V176 ""            ""          "DAAM1"        ""
## V177 ""            ""          "AGPAT4"       ""
## V178 ""            ""          "CCDC28A"      ""
## V179 ""            ""          "GMPS"         ""
## V180 ""            ""          "ACP5"         ""
## V181 ""            ""          "SLC10A3"      ""
## V182 ""            ""          "ALDH6A1"      ""
## V183 ""            ""          "CIR1"         ""
## V184 ""            ""          "RBM5"         ""
## V185 ""            ""          "HTRA2"        ""
```

```
## V186 ""             ""           "IGSF3"         ""
## V187 ""             ""           "BTRC"          ""
## V188 ""             ""           "PGLS"          ""
## V189 ""             ""           "SLC66A2"       ""
## V190 ""             ""           "SDCBP"         ""
## V191 ""             ""           "LRP10"         ""
## V192 ""             ""           "NEK7"          ""
## V193 ""             ""           "ARL2BP"        ""
## V194 ""             ""           "ENDOD1"        ""
## V195 ""             ""           "P4HA2"         ""
## V196 ""             ""           "HTATIP2"       ""
## V197 ""             ""           "SLC7A11"       ""
## V198 ""             ""           "KHNYN"         ""
## V199 ""             ""           "MBOAT2"        ""
## V200 ""             ""           "ATP6V0A1"      ""
## V201 ""             ""           "CAST"          ""
## V202 ""             ""           "TYR"           ""
##      IL2_STAT5_SIGNALING BILE_ACID_METABOLISM PEROXISOME ALLOGRAFT_REJECTION
## V3   "SOCS2"             "SCP2"               "ABCD3"    "PTPRC"
## V4   "CISH"              "ABCD3"              "ACOT8"    "IL12B"
## V5   "PIM1"              "SLC27A2"            "ACOX1"    "TGFB1"
## V6   "IL2RA"             "HSD3B7"             "ACSL1"    "IL12A"
## V7   "TNFRSF4"           "HSD17B4"            "ECH1"     "CD3E"
## V8   "SOCS1"             "AKR1D1"             "ECI2"     "CD3D"
## V9   "TNFRSF9"           "ABCD2"              "EHHADH"   "CD28"
## V10  "XBP1"              "PEX1"               "GSTK1"    "LYN"
## V11  "RRAGD"             "CYP8B1"             "HSD17B4"  "HCLS1"
## V12  "HK2"               "PNPLA8"             "MLYCD"    "IL18"
## V13  "PHLDA1"            "PHYH"               "PEX11A"   "CRTAM"
## V14  "IL2RB"             "SLC27A5"            "RETSAT"   "IFNG"
## V15  "CTLA4"             "CYP7B1"             "SLC27A2"  "CD3G"
## V16  "NFIL3"             "CYP27A1"            "PEX13"    "CD86"
## V17  "CD83"              "PEX26"              "PEX14"    "IL10"
## V18  "IKZF2"             "AGXT"               "SCP2"     "UBE2N"
## V19  "IL10"              "PEX7"               "HSD3B7"   "BCL10"
## V20  "TNFRSF18"          "CROT"               "GNPAT"    "CD4"
## V21  "DHRS3"             "CYP39A1"            "ABCD2"    "LCK"
## V22  "ECM1"              "ABCA3"              "SLC25A17" "NCK1"
## V23  "ADAM19"            "CYP7A1"             "PEX2"     "C2"
## V24  "SLC2A3"            "HACL1"              "ACAA1"    "HLA-A"
## V25  "HIPK2"             "PIPOX"              "HAO2"     "ITGB2"
## V26  "BATF3"             "PEX6"               "HSD17B11" "HLA-DQA1"
## V27  "BHLHE40"           "SOD1"               "CRAT"     "CD1D"
## V28  "PTGER2"            "GNPAT"              "PEX11B"   "CD80"
## V29  "DENND5A"           "HSD3B1"             "LONP2"    "HLA-DRA"
## V30  "ITIH5"             "ABCA2"              "IDH1"     "THY1"
## V31  "PHTF2"             "HAO1"               "FIS1"     "TLR1"
## V32  "GADD45B"           "PEX16"              "PEX6"     "HLA-G"
## V33  "NRP1"              "ABCD1"              "ABCB4"    "HLA-DMB"
## V34  "NCOA3"             "ACSL1"              "SOD1"     "IL7"
## V35  "CD79B"             "MLYCD"              "ABCB1"    "IL4"
## V36  "AHR"               "ABCG8"              "ISOC1"    "TNF"
## V37  "TNFRSF1B"          "AQP9"               "YWHAH"    "CD247"
## V38  "NDRG1"             "ISOC1"              "EPHX2"    "IL2"
```

```
## V39  "BCL2L1"          "NR1H4"          "ABCD1"    "HLA-DMA"
## V40  "GABARAPL1"       "PEX19"          "HMGCL"    "STAT1"
## V41  "LIF"             "NPC1"           "ACSL5"    "IRF4"
## V42  "TIAM1"           "HSD17B11"       "ALDH9A1"  "SRGN"
## V43  "BMPR2"           "AMACR"          "DHCR24"   "INHBA"
## V44  "MAP3K8"          "CYP46A1"        "ELOVL5"   "TLR3"
## V45  "RHOB"            "PEX13"          "NUDT19"   "ZAP70"
## V46  "MYC"             "IDH1"           "PRDX5"    "CD74"
## V47  "S100A1"          "PEX11A"         "CTPS1"    "CD40"
## V48  "ETFBKMT"         "HSD17B6"        "IDE"      "TRAF2"
## V49  "CAPG"            "EPHX2"          "SLC23A2"  "B2M"
## V50  "ST3GAL4"         "PRDX5"          "PEX5"     "BCL3"
## V51  "PENK"            "PXMP2"          "BCL10"    "LTB"
## V52  "IRF4"            "BBOX1"          "NR1I2"    "IFNGR1"
## V53  "CST7"            "FADS2"          "TSPO"     "CCR5"
## V54  "WLS"             "ALDH9A1"        "CNBP"     "CD40LG"
## V55  "TLR7"            "APOA1"          "MSH2"     "HLA-DOA"
## V56  "IKZF4"           "OPTN"           "DHRS3"    "GLMN"
## V57  "GBP4"            "GSTK1"          "DIO1"     "IL6"
## V58  "RGS16"           "ABCG4"          "SLC25A4"  "HLA-E"
## V59  "SPP1"            "ALDH8A1"        "PRDX1"    "CD2"
## V60  "IL13"            "NR3C2"          "IDI1"     "CCL5"
## V61  "SLC29A2"         "ABCA6"          "HRAS"     "FAS"
## V62  "NFKBIZ"          "RETSAT"         "MVP"      "FASLG"
## V63  "IL4R"            "FADS1"          "ABCC8"    "TLR6"
## V64  "MXD1"            "PECR"           "CLN6"     "PF4"
## V65  "CSF2"            "PEX12"          "CAT"      "TGFB2"
## V66  "FAH"             "CAT"            "ACSL4"    "CD79A"
## V67  "CTSZ"            "GNMT"           "IDH2"     "INHBB"
## V68  "ITGAE"           "ABCA9"          "ABCC5"    "ELANE"
## V69  "MUC1"            "ACSL5"          "SOD2"     "SPI1"
## V70  "MAPKAPK2"        "LONP2"          "SLC35B2"  "MAP3K7"
## V71  "TNFRSF21"        "DHCR24"         "FDPS"     "IL15"
## V72  "NT5E"            "ABCA8"          "ALB"      "CTSS"
## V73  "FLT3LG"          "PFKM"           "FADS1"    "CD47"
## V74  "CCND2"           "DIO1"           "STS"      "PRF1"
## V75  "TRAF1"           "RXRA"           "SMARCC1"  "IL12RB1"
## V76  "LCLAT1"          "FDXR"           "ITGB1BP1" "LCP2"
## V77  "IL3RA"           "TTR"            "SIAH1"    "SOCS1"
## V78  "CYFIP1"          "KLF1"           "SLC25A19" "CDKN2A"
## V79  "BCL2"            "SLC29A1"        "CDK7"     "STAT4"
## V80  "FGL2"            "BCAR3"          "RXRG"     "CD7"
## V81  "PRNP"            "LCK"            "ALDH1A1"  "HLA-DOB"
## V82  "EEF1AKMT1"       "PEX11G"         "UGT2B17"  "CD8A"
## V83  "PUS1"            "SLCO1A2"        "CADM1"    "ICAM1"
## V84  "ITGAV"           "ALDH1A1"        "SERPINA6" "CCL4"
## V85  "NCS1"            "SULT1B1"        "CLN8"     "GZMB"
## V86  "DCPS"            "NR1I2"          "RDH11"    "CSF1"
## V87  "AMACR"           "GC"             "CTBP1"    "IL11"
## V88  "FAM126B"         "ABCA4"          "HSD11B2"  "STAB1"
## V89  "PTH1R"           "SLC35B2"        "TTR"      "IL2RA"
## V90  "ODC1"            "SLC23A1"        "ERCC3"    "NLRP3"
## V91  "IGF1R"           "NUDT12"         "ATXN1"    "CCND3"
## V92  "PTCH1"           "ABCA1"          "SULT2B1"  "EIF3A"
```

```
## V93  "ENO3"          "PAOX"          "CRABP2"   "SIT1"
## V94  "CD81"          "SLC22A18"      "CRABP1"   "IFNAR2"
## V95  "MAFF"          "DIO2"          "TOP2A"    "HDAC9"
## V96  "EMP1"          "RBP1"          "SCGB1A1"  "CARTPT"
## V97  "CDKN1C"        "SLC23A2"       "ERCC1"    "TRAT1"
## V98  "CAPN3"         "ATXN1"         "DLG4"     "CCL22"
## V99  "IL1R2"         "GCLM"          "PABPC1"   "APBB1"
## V100 "SYT11"         "NEDD4"         "FABP6"    "FYB1"
## V101 "TTC39B"        "RXRG"          "ABCB9"    "IL1B"
## V102 "ANXA4"         "AR"            "CACNA1B"  "TIMP1"
## V103 "BATF"          "BMP6"          "SEMA3C"   "RPS19"
## V104 "P4HA1"         "SERPINA6"      "VPS4B"    "JAK2"
## V105 "GPR65"         "LIPE"          "CEL"      "KRT1"
## V106 "SLC1A5"        "EFHC1"         "ESR2"     "WARS1"
## V107 "IGF2R"         "IDH2"          ""         "IFNGR2"
## V108 "CKAP4"         "IDI1"          ""         "CCR2"
## V109 "CCR4"          "CH25H"         ""         "EREG"
## V110 "CD44"          "ABCA5"         ""         "MMP9"
## V111 "P2RX4"         "SULT2B1"       ""         "EGFR"
## V112 "GATA1"         "SOAT2"         ""         "IL16"
## V113 "KLF6"          "TFCP2L1"       ""         "CFP"
## V114 "ARL4A"         "NR0B2"         ""         "WAS"
## V115 "HOPX"          ""              ""         "ITGAL"
## V116 "GPR83"         ""              ""         "KLRD1"
## V117 "ITGA6"         ""              ""         "RARS1"
## V118 "CD48"          ""              ""         "TLR2"
## V119 "DRC1"          ""              ""         "CCND2"
## V120 "SELP"          ""              ""         "IL2RG"
## V121 "GLIPR2"        ""              ""         "ETS1"
## V122 "SMPDL3A"       ""              ""         "ITK"
## V123 "PLSCR1"        ""              ""         "NCR1"
## V124 "FURIN"         ""              ""         "MAP4K1"
## V125 "SERPINB6"      ""              ""         "CCL19"
## V126 "TNFSF11"       ""              ""         "PSMB10"
## V127 "GPX4"          ""              ""         "RPL39"
## V128 "LRRC8C"        ""              ""         "EIF3J"
## V129 "CCNE1"         ""              ""         "ABCE1"
## V130 "CASP3"         ""              ""         "CD8B"
## V131 "SH3BGRL2"      ""              ""         "F2"
## V132 "SNX9"          ""              ""         "ELF4"
## V133 "PLEC"          ""              ""         "LY86"
## V134 "BMP2"          ""              ""         "FCGR2B"
## V135 "ICOS"          ""              ""         "GBP2"
## V136 "ALCAM"         ""              ""         "PRKCG"
## V137 "LTB"           ""              ""         "RPS9"
## V138 "ENPP1"         ""              ""         "MTIF2"
## V139 "IL1RL1"        ""              ""         "GZMA"
## V140 "MYO1C"         ""              ""         "AARS1"
## V141 "IFNGR1"        ""              ""         "CD96"
## V142 "PLIN2"         ""              ""         "CSK"
## V143 "IL18R1"        ""              ""         "HIF1A"
## V144 "AHNAK"         ""              ""         "CCL2"
## V145 "PRKCH"         ""              ""         "ICOSLG"
## V146 "TNFRSF8"       ""              ""         "NPM1"
```

```
## V147 "SYNGR2"          ""                ""        "IL4R"
## V148 "GALM"            ""                ""        "CCL11"
## V149 "POU2F1"          ""                ""        "NME1"
## V150 "EOMES"           ""                ""        "FLNA"
## V151 "NOP2"            ""                ""        "GPR65"
## V152 "PTRH2"           ""                ""        "ACHE"
## V153 "RHOH"            ""                ""        "EIF3D"
## V154 "CDC6"            ""                ""        "IGSF6"
## V155 "MYO1E"           ""                ""        "F2R"
## V156 "CXCL10"          ""                ""        "IL13"
## V157 "SNX14"           ""                ""        "TAP1"
## V158 "IRF6"            ""                ""        "DARS1"
## V159 "IL10RA"          ""                ""        "IRF7"
## V160 "MAP6"            ""                ""        "ACVR2A"
## V161 "TNFSF10"         ""                ""        "CXCR3"
## V162 "SPRED2"          ""                ""        "PRKCB"
## V163 "SELL"            ""                ""        "CXCL9"
## V164 "SERPINC1"        ""                ""        "PTPN6"
## V165 "CDCP1"           ""                ""        "NCF4"
## V166 "RORA"            ""                ""        "UBE2D1"
## V167 "COCH"            ""                ""        "LIF"
## V168 "CSF1"            ""                ""        "CCR1"
## V169 "F2RL2"           ""                ""        "MBL2"
## V170 "UCK2"            ""                ""        "DEGS1"
## V171 "CA2"             ""                ""        "TPD52"
## V172 "IFITM3"          ""                ""        "AKT1"
## V173 "UMPS"            ""                ""        "RIPK2"
## V174 "HUWE1"           ""                ""        "IKBKB"
## V175 "COL6A1"          ""                ""        "GCNT1"
## V176 "ABCB1"           ""                ""        "SOCS5"
## V177 "RNH1"            ""                ""        "IRF8"
## V178 "IRF8"            ""                ""        "TAP2"
## V179 "GUCY1B1"         ""                ""        "EIF4G3"
## V180 "AHCY"            ""                ""        "ABI1"
## V181 "PRAF2"           ""                ""        "CCL7"
## V182 "GSTO1"           ""                ""        "IL2RB"
## V183 "TWSG1"           ""                ""        "BRCA1"
## V184 "CDC42SE2"        ""                ""        "FGR"
## V185 "PLAGL1"          ""                ""        "IL18RAP"
## V186 "APLP1"           ""                ""        "MRPL3"
## V187 "PLPP1"           ""                ""        "CXCL13"
## V188 "SPRY4"           ""                ""        "CAPG"
## V189 "SCN9A"           ""                ""        "EIF5A"
## V190 "SHE"             ""                ""        "RPS3A"
## V191 "PDCD2L"          ""                ""        "GALNT1"
## V192 "CCND3"           ""                ""        "ST8SIA4"
## V193 "LRIG1"           ""                ""        "CCL13"
## V194 "SWAP70"          ""                ""        "RPL3L"
## V195 "SLC39A8"         ""                ""        "LY75"
## V196 "RABGAP1L"        ""                ""        "TAPBP"
## V197 "TGM2"            ""                ""        "NOS2"
## V198 "PNP"             ""                ""        "RPL9"
## V199 "AGER"            ""                ""        "BCAT1"
## V200 "ETV4"            ""                ""        "IL9"
```

```
## V201 "CD86"              ""                   ""         "IL27RA"
## V202 ""                  ""                   ""         "DYRK3"
##      SPERMATOGENESIS KRAS_SIGNALING_UP KRAS_SIGNALING_DN PANCREAS_BETA_CELLS
## V3   "PDHA2"         "ANGPTL4"         "CDH16"           "PAX6"
## V4   "TSSK2"         "ITGA2"           "SPTBN2"          "NEUROD1"
## V5   "TNP1"          "SPRY2"           "FGFR3"           "ISL1"
## V6   "ZPBP"          "HBEGF"           "NOS1"            "NKX2-2"
## V7   "DPEP3"         "RBP4"            "PDE6B"           "PCSK1"
## V8   "ADAM2"         "HSD11B1"         "SIDT1"           "NKX6-1"
## V9   "ACTL7B"        "ETV4"            "NTF3"            "SLC2A2"
## V10  "GAPDHS"        "GLRX"            "SCN10A"          "SEC11A"
## V11  "TUBA3C"        "DUSP6"           "TAS2R4"          "DCX"
## V12  "LDHC"          "SCG5"            "DTNB"            "SPCS1"
## V13  "DDX25"         "ETV5"            "HTR1D"           "FOXA2"
## V14  "PRM2"          "ITGB2"           "MAST3"           "GCK"
## V15  "TCP11"         "AKT2"            "SLC6A3"          "MAFB"
## V16  "PIAS2"         "PPBP"            "CLDN8"           "INS"
## V17  "PAPOLB"        "G0S2"            "TGM1"            "PDX1"
## V18  "OAZ3"          "GABRA3"          "PCDHB1"          "ABCC8"
## V19  "PHF7"          "IRF8"            "THRB"            "IAPP"
## V20  "ODF1"          "BIRC3"           "YPEL1"           "SRP9"
## V21  "ACRBP"         "FGF9"            "RYR2"            "NEUROG3"
## V22  "YBX2"          "DCBLD2"          "GDNF"            "FOXO1"
## V23  "CSNK2A2"       "INHBA"           "CAMK1D"          "AKT3"
## V24  "NAA11"         "TFPI"            "AMBN"            "GCG"
## V25  "TULP2"         "TSPAN1"          "LFNG"            "DPP4"
## V26  "ADAD1"         "ADAM8"           "SERPINA10"       "PAX4"
## V27  "SYCP1"         "SLPI"            "ALOX12B"         "SYT13"
## V28  "DDX4"          "PRKG2"           "CALCB"           "SCGN"
## V29  "MLF1"          "MMP11"           "FGGY"            "HNF1A"
## V30  "TEKT2"         "MMP10"           "SPRR3"           "STXBP1"
## V31  "SPATA6"        "TMEM158"         "ATP6V1B1"        "CHGA"
## V32  "PGK2"          "TNFAIP3"         "EDN1"            "VDR"
## V33  "HSPA2"         "PRDM1"           "UPK3B"           "PCSK2"
## V34  "ACRV1"         "GALNT3"          "GAMT"            "INSM1"
## V35  "CLPB"          "ETS1"            "PRODH"           "SST"
## V36  "CRISP2"        "MMP9"            "RYR1"            "ELP4"
## V37  "ZC2HC1C"       "WNT7A"           "GPR19"           "SRPRB"
## V38  "AKAP4"         "IGFBP3"          "SLC29A3"         "PAK3"
## V39  "CCNA1"         "SPP1"            "EDN2"            "G6PC2"
## V40  "CCT6B"         "ETV1"            "GPRC5C"          "PKLR"
## V41  "PACRG"         "CLEC4A"          "C5"              "LMO2"
## V42  "GSG1"          "CCND2"           "ZC2HC1C"         "SRP14"
## V43  "THEG"          "TSPAN7"          "EDAR"            ""
## V44  "HSPA4L"        "ITGBL1"          "KCNMB1"          ""
## V45  "CST8"          "EMP1"            "TENT5C"          ""
## V46  "DCC"           "CDADC1"          "STAG3"           ""
## V47  "HSPA1L"        "KIF5C"           "KRT4"            ""
## V48  "GSTM3"         "TRIB2"           "SLC25A23"        ""
## V49  "DNAJB8"        "SDCCAG8"         "INSL5"           ""
## V50  "IL13RA2"       "PCP4"            "GP1BA"           ""
## V51  "CAMK4"         "CFHR2"           "KMT2D"           ""
## V52  "LPIN1"         "ALDH1A2"         "ABCG4"           ""
## V53  "ZC3H14"        "NR0B2"           "MYH7"            ""
```

```
## V54  "COIL"          "ALDH1A3"        "BRDT"           ""
## V55  "PHKG2"         "AMMECR1"        "PTGFR"          ""
## V56  "KIF2C"         "SATB1"          "KCNN1"          ""
## V57  "RPL39L"        "GUCY1A1"        "SELENOP"        ""
## V58  "SLC2A5"        "CSF2"           "IFI44L"         ""
## V59  "PCSK4"         "APOD"           "PROP1"          ""
## V60  "AURKA"         "TOR1AIP2"       "LGALS7"         ""
## V61  "MLLT10"        "CMKLR1"         "BMPR1B"         ""
## V62  "NOS1"          "TMEM176B"       "PDK2"           ""
## V63  "ART3"          "ADGRA2"         "DCC"            ""
## V64  "CCNB2"         "LAPTM5"         "SNCB"           ""
## V65  "NPHP1"         "CD37"           "COL2A1"         ""
## V66  "CLGN"          "CAB39L"         "UGT2B17"        ""
## V67  "MAST2"         "CIDEA"          "NPY4R"          ""
## V68  "MTOR"          "ZNF639"         "DLK2"           ""
## V69  "CDKN3"         "IL1B"           "WNT16"          ""
## V70  "ZNRF4"         "GYPC"           "SLC6A14"        ""
## V71  "AGFG1"         "LY96"           "ITGB1BP2"       ""
## V72  "SNAP91"        "FLT4"           "SLC12A3"        ""
## V73  "PSMG1"         "SPON1"          "YBX2"           ""
## V74  "CHFR"          "BMP2"           "CKM"            ""
## V75  "TNP2"          "PLEK2"          "CPB1"           ""
## V76  "EZH2"          "IGF2"           "MAGIX"          ""
## V77  "HBZ"           "NR1H4"          "ARHGDIG"        ""
## V78  "ARL4A"         "SNAP25"         "CALML5"         ""
## V79  "SLC12A2"       "ACE"            "KRT1"           ""
## V80  "BRAF"          "PRRX1"          "MTHFR"          ""
## V81  "VDAC3"         "C3AR1"          "ABCB11"         ""
## V82  "POMC"          "TRAF1"          "MYOT"           ""
## V83  "IFT88"         "TLR8"           "CELSR2"         ""
## V84  "TKTL1"         "ID2"            "KLK7"           ""
## V85  "NEK2"          "TMEM100"        "THNSL2"         ""
## V86  "STAM2"         "PLAUR"          "CHRNG"          ""
## V87  "H1-6"          "GADD45G"        "NR4A2"          ""
## V88  "GMCL1"         "CBX8"           "CD40LG"         ""
## V89  "MTNR1A"        "SCN1B"          "KRT13"          ""
## V90  "RFC4"          "PTBP2"          "GP2"            ""
## V91  "DBF4"          "NAP1L2"         "CD207"          ""
## V92  "PRKAR2A"       "AKAP12"         "CCR8"           ""
## V93  "TTK"           "PLAT"           "ZBTB16"         ""
## V94  "DMC1"          "SCG3"           "PRKN"           ""
## V95  "NCAPH"         "ANO1"           "CPA2"           ""
## V96  "PEBP1"         "IL1RL2"         "MEFV"           ""
## V97  "CHRM4"         "CXCL10"         "CCNA1"          ""
## V98  "TOPBP1"        "ATG10"          "SLC38A3"        ""
## V99  "SCG5"          "YRDC"           "KLK8"           ""
## V100 "NEFH"          "HDAC9"          "CYP39A1"        ""
## V101 "MAP7"          "PEG3"           "KCNQ2"          ""
## V102 "BUB1"          "SEMA3B"         "SLC30A3"        ""
## V103 "SEPTIN4"       "TNNT2"          "CHST2"          ""
## V104 "PGS1"          "LIF"            "ITIH3"          ""
## V105 "NPY5R"         "CFB"            "EGF"            ""
## V106 "TSN"           "BTC"            "MSH5"           ""
## V107 "CDK1"          "PPP1R15A"       "TEX15"          ""
```

```
## V108 "SHE"          "PTPRR"          "CLPS"           ""
## V109 "PARP2"        "CCL20"          "ENTPD7"         ""
## V110 "TNNI3"        "ARG1"           "CLSTN3"         ""
## V111 "PCSK1N"       "RETN"           "CYP11B2"        ""
## V112 "IDE"          "KLF4"           "CLDN16"         ""
## V113 "GPR182"       "MMD"            "HSD11B2"        ""
## V114 "RAD17"        "PDCD1LG2"       "COQ8A"          ""
## V115 "TLE4"         "H2BC3"          "HNF1A"          ""
## V116 "ACE"          "HOXD11"         "FGF22"          ""
## V117 "SIRT1"        "TRIB1"          "TFCP2L1"        ""
## V118 "HTR5A"        "F2RL1"          "OXT"            ""
## V119 "TALDO1"       "ANXA10"         "KCND1"          ""
## V120 "NF2"          "TSPAN13"        "MACROH2A2"      ""
## V121 "CLVS1"        "MTMR10"         "NRIP2"          ""
## V122 "CNIH2"        "CFH"            "RGS11"          ""
## V123 "GRM8"         "LAT2"           "CPEB3"          ""
## V124 "STRBP"        "ERO1A"          "TG"             ""
## V125 "ADCYAP1"      "RELN"           "PTPRJ"          ""
## V126 "ALOX15"       "KCNN4"          "NUDT11"         ""
## V127 "MEP1B"        "TMEM176A"       "FSHB"           ""
## V128 "SCG3"         "MAP4K1"         "IDUA"           ""
## V129 "GFI1"         "PTGS2"          "TNNI3"          ""
## V130 "ELOVL3"       "IL33"           "GTF3C5"         ""
## V131 "IL12RB2"      "MAFB"           "TFF2"           ""
## V132 "DMRT1"        "LCP1"           "SSTR4"          ""
## V133 "GAD1"         "NGF"            "COPZ2"          ""
## V134 "CFTR"         "CA2"            "PDCD1"          ""
## V135 "JAM3"         "SERPINA3"       "SLC16A7"        ""
## V136 "IP6K1"        "RGS16"          "KCNE2"          ""
## V137 "HOXB1"        "CTSS"           "MFSD6"          ""
## V138 ""             "USP12"          "KLHDC8A"        ""
## V139 ""             "CPE"            "CNTFR"          ""
## V140 ""             "SPARCL1"        "IL5"            ""
## V141 ""             "ABCB1"          "NPHS1"          ""
## V142 ""             "USH1C"          "SCGB1A1"        ""
## V143 ""             "CSF2RA"         "CCDC106"        ""
## V144 ""             "BTBD3"          "PAX3"           ""
## V145 ""             "IL2RG"          "VPREB1"         ""
## V146 ""             "DNMBP"          "TSHB"           ""
## V147 ""             "IL10RA"         "CACNA1F"        ""
## V148 ""             "EREG"           "AKR1B10"        ""
## V149 ""             "PRELID3B"       "P2RX6"          ""
## V150 ""             "EPHB2"          "KRT15"          ""
## V151 ""             "FBXO4"          "PAX4"           ""
## V152 ""             "CROT"           "BTG2"           ""
## V153 ""             "MPZL2"          "GPR3"           ""
## V154 ""             "ANKH"           "GRID2"          ""
## V155 ""             "CBR4"           "TCL1A"          ""
## V156 ""             "DOCK2"          "PLAG1"          ""
## V157 ""             "GPRC5B"         "PKP1"           ""
## V158 ""             "RABGAP1L"       "IRS4"           ""
## V159 ""             "MALL"           "IL12B"          ""
## V160 ""             "STRN"           "EPHA5"          ""
## V161 ""             "ST6GAL1"        "SOX10"          ""
```

```
## V162 ""             "PIGR"           "SNN"            ""
## V163 ""             "VWA5A"          "CACNG1"         ""
## V164 ""             "PSMB8"          "SPHK2"          ""
## V165 ""             "F13A1"          "IGFBP2"         ""
## V166 ""             "NRP1"           "CAPN9"          ""
## V167 ""             "SOX9"           "TCF7L1"         ""
## V168 ""             "JUP"            "TGFB2"          ""
## V169 ""             "ADGRL4"         "SMPX"           ""
## V170 ""             "ZNF277"         "LYPD3"          ""
## V171 ""             "EPB41L3"        "PNMT"           ""
## V172 ""             "PCSK1N"         "SYNPO"          ""
## V173 ""             "FUCA1"          "MX1"            ""
## V174 ""             "PLVAP"          "IFNG"           ""
## V175 ""             "ADAM17"         "NR6A1"          ""
## V176 ""             "AVL9"           "ACTC1"          ""
## V177 ""             "ADAMDEC1"       "RSAD2"          ""
## V178 ""             "HKDC1"          "ADRA2C"         ""
## V179 ""             "MAP7"           "BARD1"          ""
## V180 ""             "IL7R"           "HTR1B"          ""
## V181 ""             "RBM4"           "FGF16"          ""
## V182 ""             "BPGM"           "TENM2"          ""
## V183 ""             "ENG"            "CDKAL1"         ""
## V184 ""             "GFPT2"          "SHOX2"          ""
## V185 ""             "PLAU"           "SGK1"           ""
## V186 ""             "GNG11"          "RIBC2"          ""
## V187 ""             "PTCD2"          "SKIL"           ""
## V188 ""             "MAP3K1"         "NGB"            ""
## V189 ""             "CBL"            "ASB7"           ""
## V190 ""             "CXCR4"          "MYO15A"         ""
## V191 ""             "NIN"            "SLC5A5"         ""
## V192 ""             "IKZF1"          "KRT5"           ""
## V193 ""             "WDR33"          "ZNF112"         ""
## V194 ""             "MYCN"           "TFAP2B"         ""
## V195 ""             "FCER1G"         "VPS50"          ""
## V196 ""             "PECAM1"         "CD80"           ""
## V197 ""             "CCSER2"         "ATP4A"          ""
## V198 ""             "SNAP91"         "ARPP21"         ""
## V199 ""             "EVI5"           "SERPINB2"       ""
## V200 ""             "TNFRSF1B"       "TLX1"           ""
## V201 ""             "GPNMB"          "EFHD1"          ""
## V202 ""             "TPH1"           "P2RY4"          ""
```

```
gs_list <- list()
for (i in c(1:ncol(exprs(signatureSet)))) {
  gs_list[[i]] <- GeneSet(exprs(signatureSet)[, i][exprs(signatureSet)[, i] != ''], setName = as.charac
}

mySignatures <- GeneSetCollection(object = gs_list); mySignatures #
```

```
## GeneSetCollection
##   names: TNFA_SIGNALING_VIA_NFKB, HYPOXIA, ..., PANCREAS_BETA_CELLS (50 total)
##   unique identifiers: JUNB, CXCL2, ..., SRP14 (4383 total)
##   types in collection:
##     geneIdType: NullIdentifier (1 total)
```

```
##     collectionType: NullCollection (1 total)
```

```
remove(gs_list)


### Calculate enrichment scores ###
callback = function(hc, mat){
  sv = svd(t(mat))$v[,1]
  dend = reorder(as.dendrogram(hc), wts = sv)
  as.hclust(dend)
}

### GSVA ###
head(exprs(exprSet))
```

```
##             res0.3_0    res0.3_1    res0.3_2     res0.3_3     res0.3_4
## TSPAN6   0.503763546 0.430795073 0.496466656 0.2691926063 0.3874863503
## TNMD     0.008381026 0.019345066 0.009537888 0.0058047225 0.0005113429
## DPM1     0.576895933 0.505894665 0.705633088 0.4036800172 0.4604125478
## SCYL3    0.027537204 0.028486198 0.028321173 0.0091273321 0.0327217456
## C1orf112 0.011633786 0.008446574 0.053402234 0.0144090395 0.0098759336
## FGR      0.001862344 0.001989247 0.001241530 0.0008870705 0.0032123432
##             res0.3_5    res0.3_6
## TSPAN6   0.03779613 0.508128726
## TNMD     0.00000000 0.003130667
## DPM1     0.15446692 0.470009515
## SCYL3    0.03071259 0.024169450
## C1orf112 0.02585296 0.017580665
## FGR      0.00000000 0.001237696
```

```
head(pData(exprSet))
```

```
##          clustering
## res0.3_0          0
## res0.3_1          1
## res0.3_2          2
## res0.3_3          3
## res0.3_4          4
## res0.3_5          5
```

```
es.gsva <- gsva(expr = exprSet, gset.idx.list = mySignatures, method='gsva', verbose=T, kcdf = 'Gaussian
```

```
## Mapping identifiers between gene sets and feature names
## Estimating GSVA scores for 50 gene sets.
## Computing observed enrichment scores
## Estimating ECDFs with Gaussian kernels
## Using parallel with 2 cores
##   |                                                                              |
```

```
saveRDS(es.gsva, 'tmp/hallmarks_gsva.Rds')
```

```
gsvaScores <- as.data.frame(t(exprs(es.gsva)))
colnames(gsvaScores) <- unlist(lapply(colnames(gsvaScores), function(x) gsub('_', ' ', paste0(c(substri
gsvaScores[1:4, 1:4]
```

```
##          Tnfa signaling via nfkb    Hypoxia Cholesterol homeostasis
## res0.3_0              0.01487205 -0.1672628              0.02836588
## res0.3_1              0.46092342  0.4414521              0.52852470
## res0.3_2             -0.45009235 -0.2708131              0.30037847
## res0.3_3             -0.42879363 -0.1592187             -0.11127617
##          Mitotic spindle
## res0.3_0    -0.425815499
## res0.3_1     0.002115246
## res0.3_2     0.428047481
## res0.3_3    -0.269101439
```

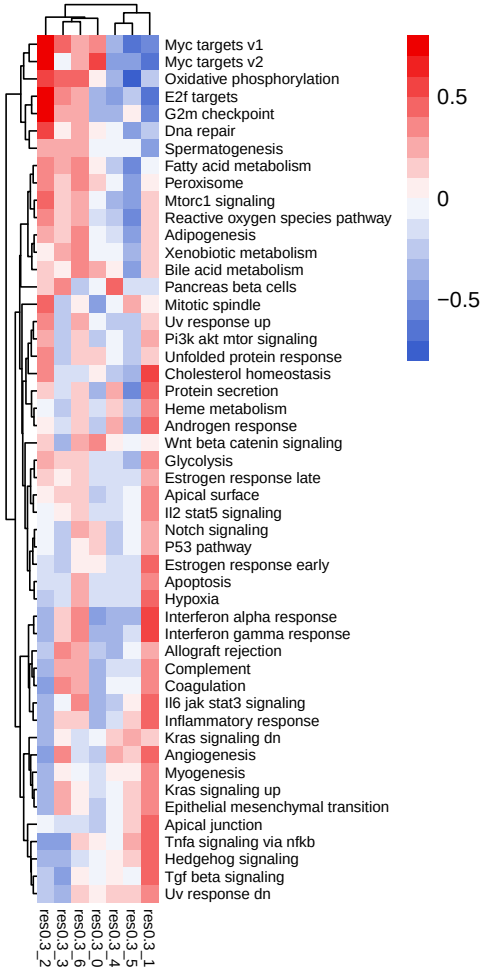
```
write.table(gsvaScores, 'gsva/hallmarks_gsvaScores.txt', quote = F, col.names = NA, sep = '\t')

min(gsvaScores)
```

```
## [1] -0.7169967
```

```
max(gsvaScores)
```

```
## [1] 0.8098164
```

```
pheatmap(t(gsvaScores), #filename = 'gsva/hallmarks_gsvaScores.pdf',
         cluster_rows = TRUE, cluster_cols = TRUE, scale = 'none', treeheight_row = 10, treeheight_col =
         cellwidth = 8, cellheight = 8, border_color = NA, fontsize_row = 7, fontsize_col = 7,
         clustering_distance_rows = 'euclidean', clustering_distance_cols = 'euclidean', clustering_meth
         breaks = c(-0.8, -0.7, -0.6, -0.5, -0.4, -0.3, -0.2, -0.1, 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0
         color = colorRampPalette(c("#3a5fcd", 'white', "#ee0000"))(n = 16))
```


Myc targets v1
Myc targets v2
Oxidative phosphorylation
E2f targets
G2m checkpoint
Dna repair
Spermatogenesis
Fatty acid metabolism
Peroxisome
Mtorc1 signaling
Reactive oxygen species pathway
Adipogenesis
Xenobiotic metabolism
Bile acid metabolism
Pancreas beta cells
Mitotic spindle
Uv response up
Pi3k akt mtor signaling
Unfolded protein response
Cholesterol homeostasis
Protein secretion
Heme metabolism
Androgen response
Wnt beta catenin signaling
Glycolysis
Estrogen response late
Apical surface
Il2 stat5 signaling
Notch signaling
P53 pathway
Estrogen response early
Apoptosis
Hypoxia
Interferon alpha response
Interferon gamma response
Allograft rejection
Complement
Coagulation
Il6 jak stat3 signaling
Inflammatory response
Kras signaling dn
Angiogenesis
Myogenesis
Kras signaling up
Epithelial mesenchymal transition
Apical junction
Tnfa signaling via nfkb
Hedgehog signaling
Tgf beta signaling
Uv response dn
res0.3_2
res0.3_3
res0.3_6
res0.3_0
res0.3_4
res0.3_5
res0.3_1
0.5
0
−0.5

```
#dev.off()
```