ToPASeq: an R package for topology-based pathway analysis of microarray and RNAseq data

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Chapter 1

Introduction

This package de-novo implements or adjusts the existing implementations of several different methods for topology-based pathway analysis of gene expression data from microarray and RNA-Seq technologies.

These high-throughput technologies are used for measuring of expression levels of thousands genes in one experiment often with the aim to find pathways and biological processes affected between two conditions. The information which biological processes are affected helps investigators to set-up biologically relevant hypotheses for further research.

To this end, a differential gene expression between conditions is assessed - by the means of specific methods, such as limma for instance, which produce lists of differentially expressed genes with specific statistics and p-values for each gene, as well as fold change of mean expression between compared groups.

Pathway analysis is the next step, where these differentially expressed genes are mapped to reference pathways derived from databases and relative enrichment is assessed. Methods of topology-based pathway analysis are the last generation of pathway analysis methods that take into account the topological structure of a pathway, which helps to increase specificity and sensitivity of the results.

This package implements seven topology-based pathway analysis methods that focus on identification of the pathways that are differentially affected between two conditions (Table 1.1). Each method is implemented as a single wrapper function which allows the user to call a method in a single command. In addition, this package offers a visualization of the results. The visualization is based on the `Rgraphviz` package and displays distribution of differential expression and topological significance of the nodes from one pathway. The user can simplify the pathway topology by merging selected sets of nodes into one (individual gene names is the only information that is lost in it).

Table 1.1: Methods included in the package.

Method	Ref.	Type	Implementation
TopologyGSA	[Massa *et al.*(2010)]	M	imported
DEGraph	[Jacob *et al.*(2010)]	M	imported
clipper	[Martini *et al.*(2012)]	M	imported
SPIA	[Tarca *et al.*(2009)], [Draghici *et al.*(2007)]	U	imported
TBS	[Al-Haj Ibrahim *et al.*(2012)]	U	de novo
PWEA	[Hung *et al.*(2010)]	U	de novo
TAPPA	[Gao and Wang(2007)]	U	de novo

M - multivariable, U - univariable

1.1 Input, output and general functionalities

The input data are either normalized (count) data or gene expression data as well as pathway topological structure.

For the sake of simplicity, our package offers in each wrapper function a preprocessing step for RNA-seq normalization - TMM [Robinson and Oshlack(2010] and DESeq [Anders and Huber(2010)]. If necessary, the functions also performs differential gene expression analysis through calling limma and DESeq2 packages.

Since some of the methods (SPIA, PRS, PWEA) work with the results of the differentiall expression analysis, the user can prepare the data by his preffered method and skip the built-in normalization and/or differential expression analysis.

To summarize, the wrapper functions give options to: 1) normalize the count data (for RNAseq) 2) apply differential expression analysis on gene-level, if applicable, and finally 3) perform topologifal pathway analysis. The functions provides output in a uniform format defined as a new S3 class topResult with basic methods (print, plot, summary) and methods for obtaining the individual parts of the output.

1.2 Pathway topological structure

Pathways and their topological structures are an important input for the analysis. They are represented as graphs $G = (V, E)$, where V denotes a set of vertices or nodes represented by genes and $E \subseteq V \times V$ is a set of edges between nodes (oriented or not, depending on the method) representing the interaction between genes. These structures can be downloaded from public databases such as KEGG or Biocarta or are available through other packages such as `graphite`.

ToPASeq is build upon `graphite` R-package where pathways from seven public databases: KEGG, Biocarta, Reactome, NCI, SPIKE, HumanCyc, Panther were downloaded and parsed into a new S4 class `pathway` (up to version 1.12.0). The parsing process deals also with a special type of nodes that can

be found in biological pathways. Protein complexes are expanded into cliques since it is assumed that all units from one complex interact with each other. A clique, from graph theory, is a subset of vertices such that every two vertices in the subset are connected by an edge. On the other hand, gene families are expanded into separate nodes with same incoming and/or outgoing edges, because they are believed to be interchangable. The most important modification is the propagation of signal through the so called compound-mediated interactions. By compound-mediated interaction we mean an interaction that engages not only genes or their product but also other chemical compounds e.g. calcium ions. `graphite` is the first package that propagates signal through such interactions. For example, if gene A interacts with compound c and compound c with gene B then in a pathway topology gene A should interact with gene B. Please see [Sales *et al.*(2012)] for more details.

```
> library(ToPASeq)
> pathways<-pathways("hsapiens", "kegg")[1:5]
> pathways[[1]]

"Acute myeloid leukemia" pathway
Native ID           = hsa:05221
Database            = KEGG
Species             = hsapiens
Type of identifiers = ENTREZID
Number of nodes     = 55
Number of edges     = 161
Retrieved on        = 24-04-2017

> str(pathways[[1]])

Formal class 'Pathway' [package "graphite"] with 7 slots
  ..@ id        : chr "hsa:05221"
  ..@ title     : chr "Acute myeloid leukemia"
  ..@ edges     :'data.frame':        161 obs. of  4 variables:
  .. ..$ src      : chr [1:161] "10000" "10000" "10000" "10000" ...
  .. ..$ dest     : chr [1:161] "1147" "1147" "2475" "2475" ...
  .. ..$ direction: Factor w/ 1 level "directed": 1 1 1 1 1 1 1 1 1 1 ...
  .. ..$ type     : chr [1:161] "Process(activation)" "Process(phosphorylation)" "Process(ac
  ..@ database  : chr "KEGG"
  ..@ species   : chr "hsapiens"
  ..@ identifier: chr "ENTREZID"
  ..@ timestamp : Date[1:1], format: "2017-04-24"
```

1.3 Preparing and manipulating pathways

The easiest way is to use pathway available through `graphite`. However, you might need to use your own pathway - the easiest way is to download it from

some database (do not forget this pathway needs to contain topological information!) and convert it to the correct format using our specific functions for pathway conversion and manipulation.

Functions `AdjacencyMatrix2Pathway` and `graphNEL2Pathway` coerce either an adjacency matrix (binary matrix, where 1 means an edge between two genes) or `graphNEL` into `Pathway`. For a reduction of a specified set of nodes (e.g. genes from the same class with similar function), which helps to simply the graphical graph representation, you can use function `reduceGraph`.

Any other topological manipulations or basic topological analysis can be achieved through `graphNEL` and conversion from and to `Pathway`. Or directly with the following functions:

intersection compute the intersection of the two supplied graphs. They must have identical nodes.

join returns the joining of the two graphs. It is similar to `intersection` but does not require the identical nodes

union compute the union of the two supplied graphs. They must have identical nodes.

subGraph Given a set of nodes and a pathway this function creates and returns subgraph with only the supplied nodes and any edges between them

clearNode Clears all edges incoming and outgoing edges from node(s)

removeEdge removes all edges between two subsets of nodes (starting in one subset and ending in the other)

removeNode removes node(s) from a pathway

nodes<- sets node labels of pathway to a specific value

degree Returns the number of incoming or outgoing edges for specified nodes

numNoEdges Returns the number of nodes without any edge

mostEdges Returns the nodes with most edges

acc Returns the set of nodes accessible from a subset of nodes. The undirected edges are considered as bidirected (directed in both directions)

connComp Returns the connected components present in a pathway. They are returned as list where each slot refers to one component and contains the relevant nodes. The undirected edges are considered as bidirected (directed in both directions)

edges Returns the edges relevant to node or all edges in the pathway

isAdjacent Checks whether two nodes are adjacent (there is an edge starting in first node and ending in the second)

isConnected Checks if a pathway contains only one connected component

isDirected Checks if all edges in a pathway are directed

edgemode Returns the type of edges in a pathway: `directed`, `undirected` or both

numEdges Returns the number of edges in a pathway

numNodes Returns the number of nodes in a pathway

edgeNames Returns the names of the edges in a following format: starting node ending node

We also especially designed function `prepareData` that converts the idendifiers of pathways, compares them agains the supplied vector of the identifiers from expression data and filters pathways with too many nodes, too few edges, not enought identifiers common with the expression data and transforms the pathways into formats reqiured in individual methods.

The normalized gene expression data or count data can be in two formats. One is an simple matrix were rows refer to genes and the other one is an `ExpressionSet`. There are four acceptable formats for the clincal data: the name or number of `phenoData` of `ExpressionSet` or a character or numeric vector that is coerced to factor. We will demonstrate the features of the package on the example of analysis of two datasets. For microarray data we will use the log2-transformed normalized expression data from the `DEGraph` package and for RNA-Seq data we will use the count data from `gageData` package. The pathway topologies are available via function `pathways()` from `graphite` package. For this demonstrantion we will use human pathways from KEGG or Biocarta.

Chapter 2

Analysis of microarray data

In our example we will use the dataset `Loi2008_DEGraphVignette` from `DEGraph` package. It conatains the expression profiles of 255 patients with hormone-dependent breast cancer stored as a matrix. The aim of the study was to determine which genes are differentially expressed between tamoxifen-resistant and tamoxifen-sensitive samples. Gene expression data matrix and vector of class labels is stored as separate objects `exprLoi2008` and `classLoi2008`, respectively. In `classLoi2008`, `0` refers to a tamoxifen-resistant sample and `1` to a tamoxifen-sensitive one. We will not need the annotation data (`annLoi2008`) or KEGG pathways `grListKEGG` in our example. On the other hand, we will use a few first pathways from `KEGG`. The pathways were selected only in order to reduce the computational complexity of the analysis. Also, the outputs from the most computationaly complex methods are displayed as comments.

We will load the package, the data and subset of the pathways with

```
> library(ToPASeq)
> library(DEGraph)
> data(Loi2008_DEGraphVignette)
> pathways<-pathways("hsapiens", "kegg")[1:5]
> ls()

[1] "annLoi2008"   "classLoi2008" "exprLoi2008"
[4] "grListKEGG"   "pathways"
```

2.1 TopologyGSA

TopologyGSA represents a multivariable method in which the expression of genes is modelled with Gausian Graphical Models with covariance matrix reflecting the pathway topology. It uses the the Iterative Proportional Scaling algorithm to estimate the covariance matrices. The testing procedure is a two-step process. First the equality of covariance matrices is tested via a likelihood ratio test. Then, when the null hypothesis of equality of covariance matrices

is not rejected, the differential expression is tested via multivariate analysis of variance. On the other hand, when the convariance matrices are not equal, then Behrens-Fisher method for testing the equality of means in a two sample problem with unequal covariance matrices is employed. This method was first implemented in the `TopologyGSA` package. In ToPASeq we have optimalized its performance by using different function for obtaining cliques from each pathway.

The method can be used with a single command

```
> top<-TopologyGSA(exprLoi2008, classLoi2008, pathways, type="MA", perms=200)
> #99 node labels mapped to the expression data
> #Average coverage 31.47657 %
> #0 (out of 5) pathways without a mapped node
> #Acute myeloid leukemia
> #Adherens junction
> #Adipocytokine signaling pathway
> #Adrenergic signaling in cardiomyocytes
> #African trypanosomiasis
> res(top)
> #$results
> #                                      t.value df.mean1 df.mean2 p.value
> #Acute myeloid leukemia                3024.796       30      224       0
> #Adherens junction                     1102.830       10      244       0
> #Adipocytokine signaling pathway       3196.432       25      229       0
> #Adrenergic signaling in cardiomyocytes 2178.476       26      228       0
> #African trypanosomiasis               1404.259        8      246       0
> #                                     lambda.value df.var  p.value.var
> #Acute myeloid leukemia                  213.01437    156 1.649509e-03
> #Adherens junction                        39.92094     10 1.749659e-05
> #Adipocytokine signaling pathway         192.81336    121 3.595452e-05
> #Adrenergic signaling in cardiomyocytes  169.47418     80 2.211953e-08
> #African trypanosomiasis                  13.02808     12 3.670031e-01
> #                                     qchisq.value var.equal q.value
> #Acute myeloid leukemia                  186.14575         1       0
> #Adherens junction                        18.30704         1       0
> #Adipocytokine signaling pathway         147.67353         1       0
> #Adrenergic signaling in cardiomyocytes  101.87947         1       0
> #African trypanosomiasis                  21.02607         0       0
> #
> #$errors
> #named list()
```

Apart from the expected arguments: a gene expression data matrix, a vector of class labels and a list of pathways, the user needs to specify the `type` argument which decides on the type of the data (`"MA"` is used for expression microarray and `"RNASeq"` for RNA-Seq data). The others arguments are optional. The `perms` argument sets the number of permutations to be used in the statistical

tests. By default both mean and variance tests are run, this can be changed to only variance test by setting `method="var"`. Arguments `convertTo` and `convertBy` control the conversion of the node labels in the pathways. The default setting is `convertTo="none"` which performs no conversion. Please note, that the node labels should be the same as the rownames of gene expression data matrix. The threshold for variance test is specified with `alpha` argument. The implementation allows also testing of all the cliques present in the graph by setting `testCliques=TRUE`. Please note that these tests may take quite a long time. The implementation returns also a gene-level statistics of the differential expression of genes performed via moderated t-test from `limma` package. These statistics are later used in the visualization of a selected pathway.

2.2 DEGraph

Another multivariable method implemented in the package is DEGraph. This method assumes the same direction in the differential expresion of genes belonging to a pathway. It performs the regular Hotelling's T2 test in the graph-Fourier space restricted to its first k components which is more powerful than test in the full graph-Fourier space or in the original space.

We apply the method with

```
> deg<-DEGraph(exprLoi2008, classLoi2008, pathways, type="MA")

90 node labels mapped to the expression data
Average coverage 30.45044 %
0 (out of 5) pathways without a mapped node
0 denoted as 0
 1 denoted as 1
 Contrasts:  1 - 0

> res(deg)

$results
$results[[1]]
                                     Overall.p
Acute myeloid leukemia               0.002819243
Adherens junction                            NA
Adipocytokine signaling pathway      0.004701942
Adrenergic signaling in cardiomyocytes 0.509241777
African trypanosomiasis              0.234212387
                                     Overall.q.value
Acute myeloid leukemia                   0.009403885
Adherens junction                                NA
Adipocytokine signaling pathway          0.009403885
Adrenergic signaling in cardiomyocytes   0.509241777
African trypanosomiasis                  0.312283182
```

```
                                      Comp1.p
Acute myeloid leukemia                0.03867702
Adherens junction                             NA
Adipocytokine signaling pathway       0.01194987
Adrenergic signaling in cardiomyocytes 0.77648925
African trypanosomiasis               0.04727610
                                      Comp1.pFourier
Acute myeloid leukemia                   0.002819243
Adherens junction                                 NA
Adipocytokine signaling pathway          0.004701942
Adrenergic signaling in cardiomyocytes   0.509241777
African trypanosomiasis                  0.234212387
                                      Comp1.k     Comp2.p
Acute myeloid leukemia                      6          NA
Adherens junction                          NA          NA
Adipocytokine signaling pathway             3 0.001039993
Adrenergic signaling in cardiomyocytes      1 0.492055041
African trypanosomiasis                     1 0.022720619
                                      Comp2.pFourier
Acute myeloid leukemia                            NA
Adherens junction                                 NA
Adipocytokine signaling pathway         0.0001691127
Adrenergic signaling in cardiomyocytes  0.7744589408
African trypanosomiasis                 0.0113681704
                                      Comp2.k
Acute myeloid leukemia                     NA
Adherens junction                          NA
Adipocytokine signaling pathway             2
Adrenergic signaling in cardiomyocytes      1
African trypanosomiasis                     1

$results$graphs
                                      Comp1.graph
Acute myeloid leukemia                ?
Adherens junction                     NA
Adipocytokine signaling pathway       ?
Adrenergic signaling in cardiomyocytes ?
African trypanosomiasis               ?
                                      Comp2.graph
Acute myeloid leukemia                NA
Adherens junction                     NA
Adipocytokine signaling pathway       ?
Adrenergic signaling in cardiomyocytes ?
African trypanosomiasis               ?
```

```
$errors
named list()
```

Apart from the expected arguments: a gene expression data matrix, a vector of class labels and a list of pathways, the user needs to specify the `type` argument which decides on the type of the data (`"MA"` is used for expression microarray and `"RNASeq"` for RNA-Seq data). The others arguments are optional. Arguments `convertTo` and `convertBy` control the conversion of the node labels in the pathways. The default setting is `convertTo="none"` which performs no conversion. Please note, that the node labels should be the same as the rownames of gene expression data matrix. Since, the DEGraph method runs a statistical test for each connected component of a pathway, a method for assigning a global p-value for whole pathway is needed. The user can select from three approaches: the minimum, the mean and the p-value of the biggest component. This is specified via `overall` argument. The implementation returns also a gene-level statistics of the differential expression of genes performed via moderated t-test from `limma` package. These statistics are later used in the visualization of a selected pathway.

2.3 clipper

The last multivariable method available within this package is called clipper. This method is similar to the topologyGSA as it uses the same two-step approach. However, the Iterative Proportional Scaling algorithm was subsituted with a shrinkage procedure of James-Stein-type which additionally allows proper estimates also in the situation when number of samples is smaller than the number of genes in a pathway. The tests on a pathway-level are follwed with a search for the most affected path in the graph.

The method can be applied with

```
> cli<-clipper( exprLoi2008, classLoi2008, pathways,type="MA", method="mean")
> #99 node labels mapped to the expression data
> #Average coverage 31.47657 %
> #0 (out of 5) pathways without a mapped node
> #0  pathways were filtered out
> #Analysing pathway:
> #
> #Acute myeloid leukemia
> #Adherens junction
> #Adipocytokine signaling pathway
> #Adrenergic signaling in cardiomyocytes
> #African trypanosomiasis
> #0 denoted as 0
> # 1 denoted as 1
> # Contrasts:  1 - 0
> #Warning messages:
```

```
> #1: In getJunctionTreePaths(graph, root) :
> #  The DAG presents cliques that are not connected.
> #2: In prunePaths(clipped, pruneLevel) : pathSummary is NULL
> #3: In getJunctionTreePaths(graph, root) :
> #  The DAG presents cliques that are not connected.
> #4: In prunePaths(clipped, pruneLevel) : pathSummary is NULL
> res(cli)$results[[1]]
> #                                    alphaVar alphaMean mean.q.value var.q.value
> #Acute myeloid leukemia                0.735     0.009       0.0150     0.91875
> #Adherens junction                     0.101     0.022       0.0275     0.26500
> #Adipocytokine signaling pathway       0.656     0.001       0.0050     0.91875
> #Adrenergic signaling in cardiomyocytes 0.106    0.061       0.0610     0.26500
> #African trypanosomiasis               0.953     0.007       0.0150     0.95300
```

Apart from the expected arguments: a gene expression data matrix, a vector of class labels and a list of pathways, the user needs to specify the `type` argument which decides on the type of the data (`"MA"` is used for expression microarray and `"RNASeq"` for RNA-Seq data). The others arguments are optional. Arguments `convertTo` and `convertBy` control the conversion of the node labels in the pathways. The default setting is `convertTo="none"` which performs no conversion. Please note, that the node labels should be the same as the rownames of gene expression data matrix. Also, both mean and variance tests are run, this can be changed to only variance test by setting `method="var"`. The `nperm` controls the number of permutations in the statistical tests. Similarly as in topologyGSA, the implementation allows testing of all the cliques present in the graph by setting `testCliques=TRUE`. Please note that these tests may take quite a long time. The implementation returns also a gene-level statistics of the differential expression of genes performed via moderated t-test from `limma` package. These statistics are later used in the visualization of a selected pathway.

The function returns two types of the results on pathway-level. The first (printed above), is a table of p-values and q-values related to the differential expression and concentration of the pathways. The second one, is a list contating the most affected paths in each pathway - these are obtained via `easyClip` function from `clipper` package.

2.4 SPIA

The most well-known topology-based pathway analysis method is SPIA. In there, two evidences of differential expression of a pathway are combined. The first evidence is a regular so called overrepresentation analysis in which the statistical significance of the number of differentially expressed genes belonging to a pathway is assessed. The second evidence reflects the pathway topology and it is called the pertubation factor. The authors assume that a differentially expressed gene at the begining of a pathway topology (e.g. a receptor in a signaling pathway) has a stronger effect on the functionality of a pathway than a

differentially expressed gene at the end of a pathway (e.g. a transcription factor in a signaling pathway). The pertubation factors of all genes are calculated from a system of linear equations and then combined within a pathway. The two evidences in a form of p-values are finally combined into a global p-value, which is used to rank the pathways.

```
> spi<-SPIA(exprLoi2008, classLoi2008,pathways , type="MA", logFC.th=-1)

0 denoted as 0
 1 denoted as 1
 Contrasts:  1 - 0
90 node labels mapped to the expression data
Average coverage 30.45044 %
0 (out of 5) pathways without a mapped node
0 denoted as 0
 1 denoted as 1
 Contrasts:  1 - 0

> res(spi)

$results
                                    pSize NDE  pNDE
Acute myeloid leukemia                 28   5 0.574
Adherens junction                      10   3 0.249
Adipocytokine signaling pathway        25   8 0.049
Adrenergic signaling in cardiomyocytes 19   3 0.687
African trypanosomiasis                 8   3 0.150
                                        tA pPERT    pG
Acute myeloid leukemia                -0.535 0.318 0.493
Adherens junction                     -0.268 0.592 0.430
Adipocytokine signaling pathway        0.139 0.694 0.149
Adrenergic signaling in cardiomyocytes -0.351 0.460 0.680
African trypanosomiasis               -0.032 0.960 0.423
                                      pGFdr pGFWER
Acute myeloid leukemia                0.61625  1.000
Adherens junction                     0.61625  1.000
Adipocytokine signaling pathway       0.61625  0.745
Adrenergic signaling in cardiomyocytes 0.68000  1.000
African trypanosomiasis               0.61625  1.000
                                         Status
Acute myeloid leukemia                Inhibited
Adherens junction                     Inhibited
Adipocytokine signaling pathway       Activated
Adrenergic signaling in cardiomyocytes Inhibited
African trypanosomiasis               Inhibited

$errors
named list()
```

Apart from the expected arguments: a gene expression data matrix, a vector of class labels and a list of pathways, the user needs to specify the `type` argument which decides on the type of the data (`"MA"` is used for expression microarray and `"RNASeq"` for RNA-Seq data). Alternatively, the user can supply the results of the differential expression analysis of genes in two forms:

1. a data.frame with columns: *ID* gene identifiers (they must match with the node labels), *logFC* log fold-changes, *t* - t-statistics, *pval* p-values, *padj* adjusted p-values. Then the user sets `type` to `DEtable`

2. a list with two slots: named vector of log fold-changes of differentially expressed genes and a vector of names of all genes analysed. Then the user sets `type` to `DElist`

The others arguments are optional. Arguments `convertTo` and `convertBy` control the conversion of the node labels in the pathways. The default setting is `convertTo="none"` which performs no conversion. Please note, that the node labels should be the same as the rownames of gene expression data matrix. The default thresholds for the differential expression analysis of genes (the moderated t-test from `limma` is used) are set with arguments `logFC.th` and `p.val.th`. The user can omit one of these criteria by setting the agrument negative value, as is shown also in the example. The implementation returns also a gene-level statistics of the differential expression of genes. These statistics are later used in the visualization of a selected pathway.

2.5 TAPPA

TAPPA was among the first topology-based pathway analysis methods. It was inspired in chemointformatics and their models for predicting the structure of molecules. In TAPPA, the gene expression values are standardized and sigma-transformed within a samples. Then, a pathway is seen a molecule, individual genes as atoms and the energy of a molecule is a score defined for one sample. This score is called Pathway Connectivity Index. The difference of expression is assessed via a common univariable two sample test - Mann-Whitney in our implemetation.

```
> tap<-TAPPA(exprLoi2008, classLoi2008, pathways, type="MA")

90 node labels mapped to the expression data
Average coverage 30.45044 %
0 (out of 5) pathways without a mapped node
0 denoted as 0
 1 denoted as 1
 Contrasts:  1 - 0

> res(tap)
```

```
$results
                                     X0.N    X0.Min.
Acute myeloid leukemia                 68 -0.3010834
Adherens junction                      68 -0.1520576
Adipocytokine signaling pathway        68 -0.3464005
Adrenergic signaling in cardiomyocytes 68 -0.1232702
African trypanosomiasis                68 -0.2149586
                                     X0.1st.Qu.
Acute myeloid leukemia           -0.07166376
Adherens junction                -0.05562008
Adipocytokine signaling pathway  -0.13935524
Adrenergic signaling in cardiomyocytes -0.02708600
African trypanosomiasis          -0.08671558
                                    X0.Median
Acute myeloid leukemia            0.032732450
Adherens junction                -0.021800852
Adipocytokine signaling pathway  -0.002324606
Adrenergic signaling in cardiomyocytes  0.008714863
African trypanosomiasis          -0.037128836
                                       X0.Mean
Acute myeloid leukemia            0.01850222
Adherens junction                -0.01692675
Adipocytokine signaling pathway  -0.01136535
Adrenergic signaling in cardiomyocytes  0.00586380
African trypanosomiasis          -0.02370909
                                 X0.3rd.Qu.   X0.Max.
Acute myeloid leukemia           0.12997388 0.3237348
Adherens junction                0.02244185 0.1333737
Adipocytokine signaling pathway  0.09996914 0.3572598
Adrenergic signaling in cardiomyocytes 0.05063597 0.1084352
African trypanosomiasis          0.03819440 0.1800719
                                     X1.N    X1.Min.
Acute myeloid leukemia                187 -0.4016187
Adherens junction                     187 -0.1535961
Adipocytokine signaling pathway       187 -0.4469216
Adrenergic signaling in cardiomyocytes 187 -0.1260913
African trypanosomiasis               187 -0.2399915
                                     X1.1st.Qu.
Acute myeloid leukemia           -0.15895634
Adherens junction                -0.03624333
Adipocytokine signaling pathway  -0.12686558
Adrenergic signaling in cardiomyocytes -0.04252090
African trypanosomiasis          -0.05885557
                                    X1.Median
Acute myeloid leukemia           -0.0505643799
Adherens junction                -0.0027597436
```

```
Adipocytokine signaling pathway         0.0009354723
Adrenergic signaling in cardiomyocytes -0.0167120746
African trypanosomiasis                -0.0036967705
                                            X1.Mean
Acute myeloid leukemia                 -0.043354141
Adherens junction                      -0.006503070
Adipocytokine signaling pathway         0.008729754
Adrenergic signaling in cardiomyocytes -0.014158035
African trypanosomiasis                 0.010747555
                                       X1.3rd.Qu.
Acute myeloid leukemia                 0.07128156
Adherens junction                      0.02826608
Adipocytokine signaling pathway        0.14163161
Adrenergic signaling in cardiomyocytes 0.01735226
African trypanosomiasis                0.06798810
                                          X1.Max.
Acute myeloid leukemia                 0.37349967
Adherens junction                      0.12397428
Adipocytokine signaling pathway        0.50971481
Adrenergic signaling in cardiomyocytes 0.09632572
African trypanosomiasis                0.40013196
                                           p.value
Acute myeloid leukemia                 0.002941806
Adherens junction                      0.209738211
Adipocytokine signaling pathway        0.405572919
Adrenergic signaling in cardiomyocytes 0.011561818
African trypanosomiasis                0.014492732
                                          q.value
Acute myeloid leukemia                 0.01470903
Adherens junction                      0.26217276
Adipocytokine signaling pathway        0.40557292
Adrenergic signaling in cardiomyocytes 0.02415455
African trypanosomiasis                0.02415455

$errors
named list()
```

Apart from the expected arguments: a gene expression data matrix, a vector of class labels and a list of pathways, the user needs to specify the `type` argument which decides on the type of the data (`"MA"` is used for expression microarray and `"RNASeq"` for RNA-Seq data). The others arguments are optional. Arguments `convertTo` and `convertBy` control the conversion of the node labels in the pathways. The default setting is `convertTo="none"` which performs no conversion. Please note, that the node labels should be the same as the rownames of gene expression data matrix. The user can also specified whether the normalization step (standardization and sigma-transformation) should be

perfomed (`normalize=TRUE`). If `verbose=TRUE`, function prints out the titles of pathways as their are analysed. The implementation returns also a gene-level statistics of the differential expression of genes. These statistics are later used in the visualization of a selected pathway.

2.6 PRS

PRS is another method that works with gene-level statistics and a list of differentially expresed genes. The pathway topology is incorporated as the number of downstream differentially expressed genes. The gene-level log fold-changes are weigted by this number and sumed up into a pathway-level score. A statistical significance is assessed by a permutations of genes.

```
> Prs<-PRS( exprLoi2008, classLoi2008, pathways, type="MA",  logFC.th=-1, nperm=100)

0 denoted as 0
 1 denoted as 1
 Contrasts:  1 - 0
90 node labels mapped to the expression data
Average coverage 30.45044 %
0 (out of 5) pathways without a mapped node
0 denoted as 0
 1 denoted as 1
 Contrasts:  1 - 0

> res(Prs)

$results
                                          nPRS p.value
Acute myeloid leukemia                -0.52168152    0.69
Adherens junction                     -0.70477036    0.69
Adipocytokine signaling pathway        0.06737978    0.31
Adrenergic signaling in cardiomyocytes -0.86877915    0.91
African trypanosomiasis               -0.25817799    0.42
                                      q.value
Acute myeloid leukemia                 0.8625
Adherens junction                      0.8625
Adipocytokine signaling pathway        0.8625
Adrenergic signaling in cardiomyocytes 0.9100
African trypanosomiasis                0.8625

$errors
named list()

>
```

Arguments of this functions are almost the same as in `SPIA`. Apart from the expected arguments: a gene expression data matrix, a vector of class labels and a list of pathways, the user needs to specify the `type` argument which decides on the type of the data (`"MA"` is used for expression microarray and `"RNASeq"` for RNA-Seq data). Alternatively, the user can supply the results of the differential expression analysis of genes in two forms:

1. a data.frame with columns: *ID* gene identifiers (they must match with the node labels), *logFC* log fold-changes, *t* - t-statistics, *pval* p-values, *padj* adjusted p-values. Then the user sets `type` to `DEtable`
2. a list with two slots: named vector of log fold-changes of differentially expressed genes and a vector of names of all genes analysed. Then the user sets `type` to `DElist`

The others arguments are optional. Arguments `convertTo` and `convertBy` control the conversion of the node labels in the pathways. The default setting is `convertTo="none"` which performs no conversion. Please note, that the node labels should be the same as the rownames of gene expression data matrix. The default thresholds for the differential expression analysis of genes (the moderated t-test from `limma` is used) are set with arguments `logFC.th` and `p.val.th`. The user can omit one of these criteria by setting the agrument negative value, as is shown also in the example. The implementation returns also a gene-level statistics of the differential expression of genes. These statistics are later used in the visualization of a selected pathway. There is one extra argument `nperm` which controls the number of permutations.

2.7 PWEA

The last method available in this package is called PathWay Enrichment Analysis (PWEA). This is actually a weigthed form of common Gene Set Enrichment Analysis (GSEA). The weights are called Topological Influence Factor (TIF) and are defined as a geometic mean of ratios of Pearson's correlation coefficient and the distance of two genes in a pathway. The weights of genes outside a pathway are assigned randomly from normal distribution with parameters estimated from the weights of genes in all pathways. A statistical significance of a pathway is assessed via Kolmogorov-Simirnov-like test statistic comparing two cumulative distribution functions with class label permutations.

```
> pwe<-PWEA(exprLoi2008, classLoi2008, pathways,  type="MA", nperm=100)
> #0 denoted as 0
> # 1 denoted as 1
> # Contrasts:  1 - 0
> #29 node labels mapped to the expression data
> #Average coverage 5.752782 %
> #1 (out of 5) pathways without a mapped node
> #1  pathways were filtered out
```

```
> # Preparing permutations..
> res(pwe)
> #$results
> #                                                ES p.value   q.value
> #Acute myeloid leukemia                 -0.1516072    0.36 0.5066667
> #Adherens junction                       0.2576037    1.00 1.0000000
> #Adipocytokine signaling pathway         0.2221782    0.38 0.5066667
> #Adrenergic signaling in cardiomyocytes -0.2265755    0.05 0.2000000
> #
> #$errors
> #named list()
>
```

Apart from the expected arguments: a gene expression data matrix, a vector of class labels and a list of pathways, the user needs to specify the `type` argument which decides on the type of the data (`"MA"` is used for expression microarray and `"RNASeq"` for RNA-Seq data). Alternatively, the user can supply a list of observed and random gene-level statistics and set `type` to `DEtable`. The observed gene-level statistics are expected as data frame with columns: *ID* gene identifiers (they must match with the node labels), *logFC* log fold-changes, *t* - t-statistics, *pval* p-values, *padj* adjusted p-values.. A data.frame of similar data.frames is expected for random statistics (it is an output from sapply function when the applied function returns a data frame). Columns should refer to the results from individual analyses after class label permutation. The others arguments are optional.Arguments `convertTo` and `convertBy` control the conversion of the node labels in the pathways. The default setting is `convertTo="none"` which performs no conversion. Please note, that the node labels should be the same as the rownames of gene expression data matrix. The `alpha` parameter sets a threshold for gene weights. The purpose of this filtering is to reduce the possiblity that a weight of a gene that is tighly correlated with a few genes are lowered by the weak correlation with other genes in a pathway. The implementation returns also a gene-level statistics of the differential expression of genes. These statistics are later used in the visualization of a selected pathway. The `nperm` argument controls the number of permutations.

Chapter 3

Analysis of RNA-Seq data

All of the methods metioned in the previus chapter were designed for the microarray data. However, the RNA-Seq technology is gaining popularity and becomes widely used. Unfortunatelly, the topology-based pathway analysis methods are not available for this type of the data. Therefore, we adapted the selected methods for RNA-Seq count matrices. Two types of adaptations were used. If a method works directly with the expression profiles (multivariable methods and TAPPA), then the count matrix is normalized and transformed either by TMM or DESeq2 method. The remaining methods use also or only the gene-level statistics like log fold-change. The differential expression analysis of genes with either `DESeq2` or `limma` package is a part of their implementation.

We will use the data from `gageData` for an example analysis.

```
> library(gageData)
> data(hnrnp.cnts)
> hnrnp.cnts<-hnrnp.cnts[rowSums(hnrnp.cnts)>0,]
> group<-c(rep("sample",4), rep("control",4))
> pathways<-pathways("hsapiens", "kegg")
>
```

3.1 TopologyGSA

TopologyGSA represents a multivariable method in which the expression of genes is modelled with Gausian Graphical Models with covariance matrix reflecting the pathway topology. It uses the the Iterative Proportional Scaling algorithm to estimate the covariance matrices. The testing procedure is a two-step process. First the equality of covariance matrices is testes via a likelihood ratio test. Then, when the null hypothesis of equality of covariance matrices is not rejected, the differential expression is testes via multivariate analysis of variance. On the other hand, when the convariance matrices are not equal, then Behrens-Fisher method for testing the equality of means in a two sample problem with unequal covariance matrices is employed.

The method can be used with a single command

```
> top<-TopologyGSA(hnrnp.cnts, group, pathways[1:3], type="RNASeq", nperm=1000)
> #528 node labels mapped to the expression data
> #Average coverage 83.16538
> #0 (out of 10) pathways without a mapped node
> #Normalization method was not specified. TMM used as default
> #Acute myeloid leukemia
> #Adherens junction
> #Adipocytokine signaling pathway
>
>
> res(top)
> #data frame with 0 columns and 1 rows
>
>
```

Apart from the expected arguments: a gene expression data matrix, a vector of class labels and a list of pathways, the user needs to specify the `type` argument which decides on the type of the data (`"MA"` is used for expression microarray and `"RNASeq"` for RNA-Seq data). The others arguments are optional. The `perms` argument sets the number of permutations to be used in the statistical tests. By default both mean and variance tests are run, this can be changed to only variance test by setting `method="var"`. Arguments `convertTo` and `convertBy` control the conversion of the node labels in the pathways. The default setting is `convertTo="none"` which performs no conversion. Please note, that the node labels should be the same as the rownames of gene expression data matrix. The threshold for variance test is specified with `alpha` argument. The implementation allows also testing of all the cliques present in the graph by setting `testCliques=TRUE`. Please note that these tests may take quite a long time. The implementation returns also a gene-level statistics of the differential expression of genes performed via moderated t-test from `limma` package. These statistics are later used in the visualization of a selected pathway.

Unfortunatelly, this method requires more samples than nodes in a pathway. Therefore there is an empty output in the example above.

3.2 DEGraph

Another multivariable method implemented in the package is DEGraph. This method assumes the same direction in the differential expresion of genes belonging to a pathway. It performs the regular Hotelling's T2 test in the graph-Fourier space restricted to its first k components which is more powerful than test in the full graph-Fourier space or in the original space.

We apply the method with

```
> deg<-DEGraph(hnrnp.cnts, group, pathways, type="RNASeq")
```

```
15481 node labels mapped to the expression data
Average coverage 85.24048 %
0 (out of 285) pathways without a mapped node
```

```
> res(deg)[[1]][[1]]
```

	Overall.p
African trypanosomiasis	7.918185e-02
Alanine, aspartate and glutamate metabolism	2.006575e-01
Aldosterone-regulated sodium reabsorption	2.581341e-01
Allograft rejection	8.546771e-01
Alzheimer's disease	6.172869e-03
Aminoacyl-tRNA biosynthesis	2.790738e-03
Amoebiasis	7.532743e-02
Antifolate resistance	1.058399e-01
Antigen processing and presentation	3.402738e-04
Arginine biosynthesis	6.507200e-03
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	1.193991e-03
Ascorbate and aldarate metabolism	1.438171e-01
Asthma	2.734131e-01
Autoimmune thyroid disease	8.546771e-01
Autophagy - other	7.849889e-02
beta-Alanine metabolism	3.118723e-01
Bile secretion	2.265908e-02
Biosynthesis of unsaturated fatty acids	2.260613e-02
Biotin metabolism	4.901114e-01
Bladder cancer	7.817641e-02
Butanoate metabolism	2.685832e-01
Caffeine metabolism	1.649342e-01
Carbohydrate digestion and absorption	2.265308e-01
Cardiac muscle contraction	6.400490e-02
Cell adhesion molecules (CAMs)	3.395629e-03
Chemical carcinogenesis	8.272405e-01
Citrate cycle (TCA cycle)	1.395835e-01
Cytosolic DNA-sensing pathway	1.585146e-02
D-Glutamine and D-glutamate metabolism	5.507362e-03
Dorso-ventral axis formation	1.751982e-03
Drug metabolism - other enzymes	2.815748e-02
Epithelial cell signaling in Helicobacter pylori infection	2.414055e-01
Fat digestion and absorption	8.051707e-02
Fatty acid biosynthesis	2.479022e-02
Fatty acid elongation	1.104508e-01
Ferroptosis	3.039620e-04
Folate biosynthesis	2.241251e-02
Galactose metabolism	2.311136e-03
Gastric acid secretion	4.163976e-01

Glycine, serine and threonine metabolism	6.679149e-03
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	1.343052e-01
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	3.251507e-02
Glycosaminoglycan degradation	9.654317e-03
Glycosphingolipid biosynthesis - ganglio series	1.371921e-01
Glycosphingolipid biosynthesis - globo and isoglobo series	2.310558e-01
Glycosphingolipid biosynthesis - lacto and neolacto series	1.739697e-01
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	7.452126e-02
Glyoxylate and dicarboxylate metabolism	4.206826e-03
Graft-versus-host disease	3.121265e-02
Histidine metabolism	1.647184e-01
Homologous recombination	1.094437e-02
Huntington's disease	1.975668e-01
Intestinal immune network for IgA production	8.546771e-01
Legionellosis	4.989744e-01
Leishmaniasis	3.636416e-01
Linoleic acid metabolism	6.579077e-02
Lipoic acid metabolism	1.777220e-01
Lysine biosynthesis	1.651783e-01
Malaria	5.874623e-02
Mannose type O-glycan biosynthesis	4.972115e-03
Maturity onset diabetes of the young	8.656706e-01
Mineral absorption	3.950384e-01
Mucin type O-glycan biosynthesis	5.441831e-02
Neuroactive ligand-receptor interaction	7.259594e-01
Nicotinate and nicotinamide metabolism	7.825523e-02
Nitrogen metabolism	5.583807e-03
One carbon pool by folate	8.538331e-02
Ovarian steroidogenesis	1.000615e-01
Pantothenate and CoA biosynthesis	7.008609e-03
Pentose and glucuronate interconversions	4.861685e-01
Pentose phosphate pathway	1.705645e-01
Peroxisome	1.313452e-02
Pertussis	4.599581e-02
Phagosome	3.927002e-03
Phenylalanine metabolism	4.078766e-01
Phenylalanine, tyrosine and tryptophan biosynthesis	6.749739e-01
Phosphonate and phosphinate metabolism	8.422351e-02
Phototransduction	1.052496e-01
Porphyrin and chlorophyll metabolism	3.150469e-01
Primary bile acid biosynthesis	2.376201e-01
Prion diseases	5.195843e-02
Propanoate metabolism	7.031314e-03
Protein processing in endoplasmic reticulum	1.191876e-01
Proximal tubule bicarbonate reclamation	1.899409e-02
Renin secretion	1.717527e-01

Renin-angiotensin system	3.720312e-01
Rheumatoid arthritis	8.470629e-02
Riboflavin metabolism	3.704894e-05
Ribosome biogenesis in eukaryotes	1.460074e-01
RNA degradation	9.035549e-02
Salivary secretion	1.384952e-01
Selenocompound metabolism	3.039575e-01
Shigellosis	4.975207e-03
SNARE interactions in vesicular transport	7.741973e-02
Staphylococcus aureus infection	1.496801e-02
Starch and sucrose metabolism	1.820901e-02
Steroid biosynthesis	3.586836e-03
Sulfur metabolism	7.137519e-01
Sulfur relay system	4.474502e-03
Synaptic vesicle cycle	5.682119e-04
Synthesis and degradation of ketone bodies	4.895921e-01
Systemic lupus erythematosus	2.365776e-02
Taste transduction	5.258486e-01
Taurine and hypotaurine metabolism	2.634644e-02
Terpenoid backbone biosynthesis	1.903874e-01
Thiamine metabolism	7.672762e-03
Tight junction	6.287270e-01
Transcriptional misregulation in cancer	8.000109e-02
Tryptophan metabolism	1.054547e-01
Type I diabetes mellitus	8.546771e-01
Tyrosine metabolism	4.161379e-01
Ubiquinone and other terpenoid-quinone biosynthesis	1.976066e-01
Vasopressin-regulated water reabsorption	3.148766e-02
Vibrio cholerae infection	3.683758e-01
Viral carcinogenesis	1.429658e-03
Viral myocarditis	2.091036e-01
Vitamin B6 metabolism	4.067789e-02
Vitamin digestion and absorption	1.032858e-01

	Overall.q.value
African trypanosomiasis	0.166684463
Alanine, aspartate and glutamate metabolism	0.278559875
Aldosterone-regulated sodium reabsorption	0.334723296
Allograft rejection	0.861981998
Alzheimer's disease	0.036073699
Aminoacyl-tRNA biosynthesis	0.036073699
Amoebiasis	0.166684463
Antifolate resistance	0.189228954
Antigen processing and presentation	0.013384104
Arginine biosynthesis	0.036073699
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.028116603
Ascorbate and aldarate metabolism	0.232471523

Asthma	0.346911199
Autoimmune thyroid disease	0.861981998
Autophagy - other	0.166684463
beta-Alanine metabolism	0.387245134
Bile secretion	0.078640319
Biosynthesis of unsaturated fatty acids	0.078640319
Biotin metabolism	0.545595658
Bladder cancer	0.166684463
Butanoate metabolism	0.344487177
Caffeine metabolism	0.253130350
Carbohydrate digestion and absorption	0.307248713
Cardiac muscle contraction	0.160693145
Cell adhesion molecules (CAMs)	0.036073699
Chemical carcinogenesis	0.861981998
Citrate cycle (TCA cycle)	0.228761805
Cytosolic DNA-sensing pathway	0.064499024
D-Glutamine and D-glutamate metabolism	0.036073699
Dorso-ventral axis formation	0.029533414
Drug metabolism - other enzymes	0.087436378
Epithelial cell signaling in Helicobacter pylori infection	0.316509375
Fat digestion and absorption	0.166684463
Fatty acid biosynthesis	0.081256839
Fatty acid elongation	0.194525334
Ferroptosis	0.013384104
Folate biosynthesis	0.078640319
Galactose metabolism	0.034089262
Gastric acid secretion	0.477038022
Glycine, serine and threonine metabolism	0.036073699
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.228761805
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.093579950
Glycosaminoglycan degradation	0.045568376
Glycosphingolipid biosynthesis - ganglio series	0.228761805
Glycosphingolipid biosynthesis - globo and isoglobo series	0.309824771
Glycosphingolipid biosynthesis - lacto and neolacto series	0.256605379
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.166684463
Glyoxylate and dicarboxylate metabolism	0.036073699
Graft-versus-host disease	0.092888590
Histidine metabolism	0.253130350
Homologous recombination	0.049670621
Huntington's disease	0.277590260
Intestinal immune network for IgA production	0.861981998
Legionellosis	0.550270848
Leishmaniasis	0.442368172
Linoleic acid metabolism	0.161735649
Lipoic acid metabolism	0.258903621
Lysine biosynthesis	0.253130350

Malaria	0.150696845
Mannose type O-glycan biosynthesis	0.036073699
Maturity onset diabetes of the young	0.865670596
Mineral absorption	0.466145261
Mucin type O-glycan biosynthesis	0.142696896
Neuroactive ligand-receptor interaction	0.764850052
Nicotinate and nicotinamide metabolism	0.166684463
Nitrogen metabolism	0.036073699
One carbon pool by folate	0.167920509
Ovarian steroidogenesis	0.189228954
Pantothenate and CoA biosynthesis	0.036073699
Pentose and glucuronate interconversions	0.545595658
Pentose phosphate pathway	0.256541986
Peroxisome	0.057402736
Pertussis	0.126221053
Phagosome	0.036073699
Phenylalanine metabolism	0.476529096
Phenylalanine, tyrosine and tryptophan biosynthesis	0.724062957
Phosphonate and phosphinate metabolism	0.167920509
Phototransduction	0.189228954
Porphyrin and chlorophyll metabolism	0.387245134
Primary bile acid biosynthesis	0.315046925
Prion diseases	0.139343064
Propanoate metabolism	0.036073699
Protein processing in endoplasmic reticulum	0.206825459
Proximal tubule bicarbonate reclamation	0.072300087
Renin secretion	0.256541986
Renin-angiotensin system	0.443431181
Rheumatoid arthritis	0.167920509
Riboflavin metabolism	0.004371775
Ribosome biogenesis in eukaryotes	0.232822608
RNA degradation	0.174786024
Salivary secretion	0.228761805
Selenocompound metabolism	0.381563612
Shigellosis	0.036073699
SNARE interactions in vesicular transport	0.166684463
Staphylococcus aureus infection	0.063079451
Starch and sucrose metabolism	0.071622121
Steroid biosynthesis	0.036073699
Sulfur metabolism	0.758763230
Sulfur relay system	0.036073699
Synaptic vesicle cycle	0.016762251
Synthesis and degradation of ketone bodies	0.545595658
Systemic lupus erythematosus	0.079760435
Taste transduction	0.574538259
Taurine and hypotaurine metabolism	0.084023776

Terpenoid backbone biosynthesis	0.273972134
Thiamine metabolism	0.037724413
Tight junction	0.680640263
Transcriptional misregulation in cancer	0.166684463
Tryptophan metabolism	0.189228954
Type I diabetes mellitus	0.861981998
Tyrosine metabolism	0.477038022
Ubiquinone and other terpenoid-quinone biosynthesis	0.277590260
Vasopressin-regulated water reabsorption	0.092888590
Vibrio cholerae infection	0.443431181
Viral carcinogenesis	0.028116603
Viral myocarditis	0.286909611
Vitamin B6 metabolism	0.114285490
Vitamin digestion and absorption	0.189228954

	Comp1.p
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	7.337280e-01
Alzheimer's disease	NA
Aminoacyl-tRNA biosynthesis	5.766187e-02
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	4.625094e-02
Ascorbate and aldarate metabolism	NA
Asthma	9.033627e-02
Autoimmune thyroid disease	7.337280e-01
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	1.838931e-02
Biotin metabolism	1.481205e-01
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	2.501006e-01
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	NA
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	8.423447e-04
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA

Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	7.560270e-02
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	9.314423e-04
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	7.337280e-01
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	1.204514e-02
Lysine biosynthesis	3.828157e-04
Malaria	4.189248e-02
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	4.820172e-01
Mineral absorption	5.837847e-03
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	1.636106e-05
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	3.399359e-02
Pertussis	NA
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	3.154819e-03
Phosphonate and phosphinate metabolism	1.201698e-01

Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	8.423447e-04
Renin secretion	NA
Renin-angiotensin system	3.785431e-01
Rheumatoid arthritis	3.273556e-02
Riboflavin metabolism	9.260918e-02
Ribosome biogenesis in eukaryotes	9.214590e-04
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	2.147479e-02
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	3.693798e-02
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	5.501854e-03
Transcriptional misregulation in cancer	7.341611e-02
Tryptophan metabolism	NA
Type I diabetes mellitus	7.337280e-01
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	7.030741e-02
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	8.268046e-03
Viral myocarditis	NA
Vitamin B6 metabolism	2.261709e-01
Vitamin digestion and absorption	3.001528e-01

	Comp1.pFourier
African trypanosomiasis	7.918185e-02
Alanine, aspartate and glutamate metabolism	2.006575e-01
Aldosterone-regulated sodium reabsorption	2.581341e-01
Allograft rejection	8.546771e-01

Alzheimer's disease	6.172869e-03
Aminoacyl-tRNA biosynthesis	2.790738e-03
Amoebiasis	7.532743e-02
Antifolate resistance	1.058399e-01
Antigen processing and presentation	3.402738e-04
Arginine biosynthesis	6.507200e-03
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	1.193991e-03
Ascorbate and aldarate metabolism	1.438171e-01
Asthma	2.734131e-01
Autoimmune thyroid disease	8.546771e-01
Autophagy - other	7.849889e-02
beta-Alanine metabolism	3.118723e-01
Bile secretion	2.265908e-02
Biosynthesis of unsaturated fatty acids	2.260613e-02
Biotin metabolism	4.901114e-01
Bladder cancer	7.817641e-02
Butanoate metabolism	2.685832e-01
Caffeine metabolism	1.649342e-01
Carbohydrate digestion and absorption	2.265308e-01
Cardiac muscle contraction	6.400490e-02
Cell adhesion molecules (CAMs)	3.395629e-03
Chemical carcinogenesis	8.272405e-01
Citrate cycle (TCA cycle)	1.395835e-01
Cytosolic DNA-sensing pathway	1.585146e-02
D-Glutamine and D-glutamate metabolism	5.507362e-03
Dorso-ventral axis formation	1.751982e-03
Drug metabolism - other enzymes	2.815748e-02
Epithelial cell signaling in Helicobacter pylori infection	2.414055e-01
Fat digestion and absorption	8.051707e-02
Fatty acid biosynthesis	2.479022e-02
Fatty acid elongation	1.104508e-01
Ferroptosis	3.039620e-04
Folate biosynthesis	2.241251e-02
Galactose metabolism	2.311136e-03
Gastric acid secretion	4.163976e-01
Glycine, serine and threonine metabolism	6.679149e-03
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	1.343052e-01
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	3.251507e-02
Glycosaminoglycan degradation	9.654317e-03
Glycosphingolipid biosynthesis - ganglio series	1.371921e-01
Glycosphingolipid biosynthesis - globo and isoglobo series	2.310558e-01
Glycosphingolipid biosynthesis - lacto and neolacto series	1.739697e-01
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	7.452126e-02
Glyoxylate and dicarboxylate metabolism	4.206826e-03
Graft-versus-host disease	3.121265e-02
Histidine metabolism	1.647184e-01

Homologous recombination	1.094437e-02
Huntington's disease	1.975668e-01
Intestinal immune network for IgA production	8.546771e-01
Legionellosis	4.989744e-01
Leishmaniasis	3.636416e-01
Linoleic acid metabolism	6.579077e-02
Lipoic acid metabolism	1.777220e-01
Lysine biosynthesis	1.651783e-01
Malaria	5.874623e-02
Mannose type O-glycan biosynthesis	4.972115e-03
Maturity onset diabetes of the young	8.656706e-01
Mineral absorption	3.950384e-01
Mucin type O-glycan biosynthesis	5.441831e-02
Neuroactive ligand-receptor interaction	7.259594e-01
Nicotinate and nicotinamide metabolism	7.825523e-02
Nitrogen metabolism	5.583807e-03
One carbon pool by folate	8.538331e-02
Ovarian steroidogenesis	1.000615e-01
Pantothenate and CoA biosynthesis	7.008609e-03
Pentose and glucuronate interconversions	4.861685e-01
Pentose phosphate pathway	1.705645e-01
Peroxisome	1.313452e-02
Pertussis	4.599581e-02
Phagosome	3.927002e-03
Phenylalanine metabolism	4.078766e-01
Phenylalanine, tyrosine and tryptophan biosynthesis	6.749739e-01
Phosphonate and phosphinate metabolism	8.422351e-02
Phototransduction	1.052496e-01
Porphyrin and chlorophyll metabolism	3.150469e-01
Primary bile acid biosynthesis	2.376201e-01
Prion diseases	5.195843e-02
Propanoate metabolism	7.031314e-03
Protein processing in endoplasmic reticulum	1.191876e-01
Proximal tubule bicarbonate reclamation	1.899409e-02
Renin secretion	1.717527e-01
Renin-angiotensin system	3.720312e-01
Rheumatoid arthritis	8.470629e-02
Riboflavin metabolism	3.704894e-05
Ribosome biogenesis in eukaryotes	1.460074e-01
RNA degradation	9.035549e-02
Salivary secretion	1.384952e-01
Selenocompound metabolism	3.039575e-01
Shigellosis	4.975207e-03
SNARE interactions in vesicular transport	7.741973e-02
Staphylococcus aureus infection	1.496801e-02
Starch and sucrose metabolism	1.820901e-02

Steroid biosynthesis	3.586836e-03
Sulfur metabolism	7.137519e-01
Sulfur relay system	4.474502e-03
Synaptic vesicle cycle	5.682119e-04
Synthesis and degradation of ketone bodies	4.895921e-01
Systemic lupus erythematosus	2.365776e-02
Taste transduction	5.258486e-01
Taurine and hypotaurine metabolism	2.634644e-02
Terpenoid backbone biosynthesis	1.903874e-01
Thiamine metabolism	7.672762e-03
Tight junction	6.287270e-01
Transcriptional misregulation in cancer	8.000109e-02
Tryptophan metabolism	1.054547e-01
Type I diabetes mellitus	8.546771e-01
Tyrosine metabolism	4.161379e-01
Ubiquinone and other terpenoid-quinone biosynthesis	1.976066e-01
Vasopressin-regulated water reabsorption	3.148766e-02
Vibrio cholerae infection	3.683758e-01
Viral carcinogenesis	1.429658e-03
Viral myocarditis	2.091036e-01
Vitamin B6 metabolism	4.067789e-02
Vitamin digestion and absorption	1.032858e-01

	Comp1.k
African trypanosomiasis	2
Alanine, aspartate and glutamate metabolism	6
Aldosterone-regulated sodium reabsorption	5
Allograft rejection	1
Alzheimer's disease	2
Aminoacyl-tRNA biosynthesis	2
Amoebiasis	2
Antifolate resistance	2
Antigen processing and presentation	3
Arginine biosynthesis	3
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	1
Ascorbate and aldarate metabolism	2
Asthma	1
Autoimmune thyroid disease	1
Autophagy - other	3
beta-Alanine metabolism	5
Bile secretion	3
Biosynthesis of unsaturated fatty acids	2
Biotin metabolism	1
Bladder cancer	4
Butanoate metabolism	4
Caffeine metabolism	1
Carbohydrate digestion and absorption	2

Cardiac muscle contraction	2
Cell adhesion molecules (CAMs)	4
Chemical carcinogenesis	5
Citrate cycle (TCA cycle)	6
Cytosolic DNA-sensing pathway	4
D-Glutamine and D-glutamate metabolism	1
Dorso-ventral axis formation	3
Drug metabolism - other enzymes	4
Epithelial cell signaling in Helicobacter pylori infection	4
Fat digestion and absorption	2
Fatty acid biosynthesis	3
Fatty acid elongation	4
Ferroptosis	2
Folate biosynthesis	2
Galactose metabolism	4
Gastric acid secretion	6
Glycine, serine and threonine metabolism	6
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	2
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	1
Glycosaminoglycan degradation	4
Glycosphingolipid biosynthesis - ganglio series	3
Glycosphingolipid biosynthesis - globo and isoglobo series	3
Glycosphingolipid biosynthesis - lacto and neolacto series	5
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	5
Glyoxylate and dicarboxylate metabolism	3
Graft-versus-host disease	2
Histidine metabolism	4
Homologous recombination	4
Huntington's disease	5
Intestinal immune network for IgA production	1
Legionellosis	4
Leishmaniasis	6
Linoleic acid metabolism	4
Lipoic acid metabolism	1
Lysine biosynthesis	1
Malaria	1
Mannose type O-glycan biosynthesis	4
Maturity onset diabetes of the young	1
Mineral absorption	1
Mucin type O-glycan biosynthesis	5
Neuroactive ligand-receptor interaction	2
Nicotinate and nicotinamide metabolism	5
Nitrogen metabolism	1
One carbon pool by folate	4
Ovarian steroidogenesis	5
Pantothenate and CoA biosynthesis	2

Pentose and glucuronate interconversions	2
Pentose phosphate pathway	6
Peroxisome	1
Pertussis	5
Phagosome	5
Phenylalanine metabolism	3
Phenylalanine, tyrosine and tryptophan biosynthesis	1
Phosphonate and phosphinate metabolism	2
Phototransduction	5
Porphyrin and chlorophyll metabolism	5
Primary bile acid biosynthesis	3
Prion diseases	4
Propanoate metabolism	6
Protein processing in endoplasmic reticulum	5
Proximal tubule bicarbonate reclamation	1
Renin secretion	4
Renin-angiotensin system	1
Rheumatoid arthritis	1
Riboflavin metabolism	2
Ribosome biogenesis in eukaryotes	1
RNA degradation	3
Salivary secretion	3
Selenocompound metabolism	3
Shigellosis	5
SNARE interactions in vesicular transport	4
Staphylococcus aureus infection	3
Starch and sucrose metabolism	5
Steroid biosynthesis	4
Sulfur metabolism	2
Sulfur relay system	2
Synaptic vesicle cycle	2
Synthesis and degradation of ketone bodies	2
Systemic lupus erythematosus	2
Taste transduction	2
Taurine and hypotaurine metabolism	2
Terpenoid backbone biosynthesis	5
Thiamine metabolism	3
Tight junction	1
Transcriptional misregulation in cancer	1
Tryptophan metabolism	6
Type I diabetes mellitus	1
Tyrosine metabolism	5
Ubiquinone and other terpenoid-quinone biosynthesis	1
Vasopressin-regulated water reabsorption	4
Vibrio cholerae infection	2
Viral carcinogenesis	1

Viral myocarditis	2
Vitamin B6 metabolism	1
Vitamin digestion and absorption	1
	Comp2.p
African trypanosomiasis	2.309317e-02
Alanine, aspartate and glutamate metabolism	2.171053e-05
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	9.033627e-02
Alzheimer's disease	NA
Aminoacyl-tRNA biosynthesis	4.629902e-04
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	3.209508e-02
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	9.033627e-02
Autophagy - other	NA
beta-Alanine metabolism	1.203602e-01
Bile secretion	3.453946e-01
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	4.152108e-01
Caffeine metabolism	NA
Carbohydrate digestion and absorption	9.140541e-05
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	NA
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	4.592931e-01
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	9.179515e-02
Epithelial cell signaling in Helicobacter pylori infection	3.341240e-04
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	1.609692e-03
Folate biosynthesis	3.810720e-02
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	4.041011e-04
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA

Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	7.337280e-01
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	4.221786e-04
Intestinal immune network for IgA production	8.182470e-01
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	7.793022e-01
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	3.503275e-02
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	1.521317e-01
Pantothenate and CoA biosynthesis	1.034919e-01
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	2.246638e-02
Pertussis	NA
Phagosome	5.760099e-03
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	5.950918e-02
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	4.189248e-02
Riboflavin metabolism	NA

Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	6.062161e-02
Starch and sucrose metabolism	NA
Steroid biosynthesis	1.162492e-04
Sulfur metabolism	NA
Sulfur relay system	1.566007e-01
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	7.337280e-01
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	6.285126e-03
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	4.829936e-02
Vasopressin-regulated water reabsorption	3.808466e-03
Vibrio cholerae infection	4.100152e-02
Viral carcinogenesis	5.896532e-02
Viral myocarditis	1.452587e-02
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp2.pFourier
African trypanosomiasis	7.870763e-03
Alanine, aspartate and glutamate metabolism	3.349319e-04
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	2.734131e-01
Alzheimer's disease	6.827591e-01
Aminoacyl-tRNA biosynthesis	6.316850e-04
Amoebiasis	6.280109e-02
Antifolate resistance	NA
Antigen processing and presentation	3.002747e-02
Arginine biosynthesis	2.713717e-01
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	1.669877e-01
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	2.734131e-01
Autophagy - other	1.100480e-02

beta-Alanine metabolism	4.328070e-02
Bile secretion	7.805723e-01
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	1.438195e-02
Butanoate metabolism	5.251320e-01
Caffeine metabolism	NA
Carbohydrate digestion and absorption	5.471848e-01
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	9.822004e-01
Chemical carcinogenesis	7.891679e-03
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	1.951185e-01
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	5.157802e-02
Epithelial cell signaling in Helicobacter pylori infection	1.942429e-05
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	2.831374e-02
Ferroptosis	9.228295e-01
Folate biosynthesis	2.764483e-01
Galactose metabolism	NA
Gastric acid secretion	4.097132e-02
Glycine, serine and threonine metabolism	4.468554e-01
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	1.536836e-03
Graft-versus-host disease	8.546771e-01
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	7.621257e-03
Intestinal immune network for IgA production	7.173703e-01
Legionellosis	3.846843e-01
Leishmaniasis	1.780213e-01
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	7.552792e-01
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA

Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	9.669939e-01
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	7.138747e-01
Pantothenate and CoA biosynthesis	2.611391e-01
Pentose and glucuronate interconversions	6.992858e-02
Pentose phosphate pathway	NA
Peroxisome	3.837823e-02
Pertussis	1.778109e-02
Phagosome	2.334366e-03
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	1.699231e-01
Proximal tubule bicarbonate reclamation	2.462910e-01
Renin secretion	7.771926e-01
Renin-angiotensin system	NA
Rheumatoid arthritis	5.874623e-02
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	9.705022e-01
Selenocompound metabolism	NA
Shigellosis	3.942977e-01
SNARE interactions in vesicular transport	5.729370e-02
Staphylococcus aureus infection	3.623750e-02
Starch and sucrose metabolism	NA
Steroid biosynthesis	9.366641e-01
Sulfur metabolism	NA
Sulfur relay system	4.681311e-01
Synaptic vesicle cycle	6.259480e-03
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	8.546771e-01
Taste transduction	2.291691e-01
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA

Transcriptional misregulation in cancer	1.537810e-01
Tryptophan metabolism	1.057855e-03
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	9.311708e-01
Vasopressin-regulated water reabsorption	1.786412e-02
Vibrio cholerae infection	3.262321e-01
Viral carcinogenesis	4.027179e-02
Viral myocarditis	3.706454e-01
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp2.k
African trypanosomiasis	1
Alanine, aspartate and glutamate metabolism	1
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	1
Alzheimer's disease	2
Aminoacyl-tRNA biosynthesis	1
Amoebiasis	2
Antifolate resistance	NA
Antigen processing and presentation	2
Arginine biosynthesis	2
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	1
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	1
Autophagy - other	2
beta-Alanine metabolism	1
Bile secretion	1
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	2
Butanoate metabolism	1
Caffeine metabolism	NA
Carbohydrate digestion and absorption	1
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	2
Chemical carcinogenesis	3
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	1
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	2
Epithelial cell signaling in Helicobacter pylori infection	1
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA

Fatty acid elongation	2
Ferroptosis	1
Folate biosynthesis	1
Galactose metabolism	NA
Gastric acid secretion	3
Glycine, serine and threonine metabolism	1
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	2
Graft-versus-host disease	1
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	1
Intestinal immune network for IgA production	1
Legionellosis	2
Leishmaniasis	4
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	1
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	1
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	1
Pantothenate and CoA biosynthesis	1
Pentose and glucuronate interconversions	2
Pentose phosphate pathway	NA
Peroxisome	1
Pertussis	2
Phagosome	1
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA

Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	3
Proximal tubule bicarbonate reclamation	1
Renin secretion	2
Renin-angiotensin system	NA
Rheumatoid arthritis	1
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	3
Selenocompound metabolism	NA
Shigellosis	5
SNARE interactions in vesicular transport	2
Staphylococcus aureus infection	1
Starch and sucrose metabolism	NA
Steroid biosynthesis	1
Sulfur metabolism	NA
Sulfur relay system	1
Synaptic vesicle cycle	2
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	1
Taste transduction	2
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	1
Tryptophan metabolism	2
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	1
Vasopressin-regulated water reabsorption	1
Vibrio cholerae infection	1
Viral carcinogenesis	1
Viral myocarditis	1
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp3.p
African trypanosomiasis	3.321571e-01
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	2.340201e-02
Aminoacyl-tRNA biosynthesis	1.993742e-02
Amoebiasis	NA

Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	1.104827e-06
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	7.812008e-06
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	2.652803e-07
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	4.851462e-03
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	4.514380e-02
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	9.698578e-03
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	5.809410e-03
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	1.509049e-02
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	4.596843e-01

Legionellosis	3.751719e-02
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	8.607069e-01
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	3.606624e-02
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	2.542899e-01
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	7.337280e-01
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	4.842019e-02
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	2.700712e-02
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA

Synaptic vesicle cycle	5.765164e-01
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	9.033627e-02
Taste transduction	1.421195e-03
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	5.713576e-01
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	8.646299e-02
Viral carcinogenesis	NA
Viral myocarditis	8.767758e-03
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp3.pFourier
African trypanosomiasis	2.078754e-01
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	2.120819e-02
Aminoacyl-tRNA biosynthesis	7.437608e-03
Amoebiasis	5.356927e-04
Antifolate resistance	NA
Antigen processing and presentation	3.023482e-01
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	9.067549e-01
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	1.508331e-03
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	1.033828e-02
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	6.730337e-04
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	9.354989e-02
Chemical carcinogenesis	NA

Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	1.437614e-03
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	6.857364e-01
Galactose metabolism	NA
Gastric acid secretion	7.103337e-01
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	4.571242e-03
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	3.592940e-01
Legionellosis	8.265930e-02
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	6.785390e-01
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	5.023725e-02
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA

Pertussis	2.504755e-01
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	9.729862e-01
Proximal tubule bicarbonate reclamation	NA
Renin secretion	1.742709e-03
Renin-angiotensin system	NA
Rheumatoid arthritis	8.546771e-01
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	9.387421e-01
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	1.208358e-02
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	5.729594e-01
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	2.734131e-01
Taste transduction	7.487996e-01
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	4.313285e-01
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	9.807019e-01
Viral carcinogenesis	NA
Viral myocarditis	1.882388e-05
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp3.k
African trypanosomiasis	1
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	2
Aminoacyl-tRNA biosynthesis	1
Amoebiasis	2
Antifolate resistance	NA
Antigen processing and presentation	2
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	1
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	1
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	1
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	1
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	2
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	1
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	1
Galactose metabolism	NA
Gastric acid secretion	2
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA

Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	1
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	1
Legionellosis	1
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	1
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	1
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	2
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	2
Proximal tubule bicarbonate reclamation	NA
Renin secretion	2
Renin-angiotensin system	NA
Rheumatoid arthritis	1
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	1

Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	1
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	1
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	1
Taste transduction	1
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	1
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	1
Viral carcinogenesis	NA
Viral myocarditis	1
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp4.p
African trypanosomiasis	9.670449e-01
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	1.493874e-02
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	1.283525e-01
Antifolate resistance	NA
Antigen processing and presentation	1.052507e-02
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA

Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	1.855272e-01
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	1.574500e-03
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	3.446937e-04
Legionellosis	2.003296e-04
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	9.033627e-02
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	4.099729e-01

Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	3.310854e-05
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	5.162751e-01
Proximal tubule bicarbonate reclamation	NA
Renin secretion	5.847373e-04
Renin-angiotensin system	NA
Rheumatoid arthritis	5.299323e-01
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	3.872234e-01
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	1.255121e-03
Tryptophan metabolism	NA
Type I diabetes mellitus	NA

Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	4.189248e-02
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp4.pFourier
African trypanosomiasis	7.953202e-01
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	4.394902e-02
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	9.267795e-02
Antifolate resistance	NA
Antigen processing and presentation	7.350070e-02
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	9.073313e-01
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	2.766077e-03
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA

Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	4.089756e-05
Legionellosis	3.731617e-03
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	2.734131e-01
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	1.633723e-01
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	1.321358e-03
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	8.372630e-02

Proximal tubule bicarbonate reclamation	NA
Renin secretion	3.108230e-01
Renin-angiotensin system	NA
Rheumatoid arthritis	2.872391e-01
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	1.495132e-01
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	9.587589e-01
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	2.894027e-01
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp4.k
African trypanosomiasis	1
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	1
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	2
Antifolate resistance	NA
Antigen processing and presentation	1
Arginine biosynthesis	NA

Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	1
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	1
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	1
Legionellosis	1
Leishmaniasis	NA
Linoleic acid metabolism	NA

Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	1
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	1
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	1
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	2
Proximal tubule bicarbonate reclamation	NA
Renin secretion	1
Renin-angiotensin system	NA
Rheumatoid arthritis	1
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA

Taste transduction	1
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	1
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	1
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp5.p
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	0.0023446943
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	0.1185723051
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA

Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	0.1542723672
Legionellosis	0.0009361784
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	0.0001554066
Phagosome	NA
Phenylalanine metabolism	NA

Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	0.0109644535
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	0.7337279566
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp5.pFourier
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA

Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	2.018559e-06
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	9.624799e-02
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA

Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	4.111363e-01
Legionellosis	4.663294e-01
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	6.515308e-01
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA

Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	1.682518e-03
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	8.546771e-01
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp5.k
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	1
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA

Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	1
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	1
Legionellosis	1
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA

Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	1
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	1
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA

Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	1
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA
	Comp6.p
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	0.0003188067
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	0.1778522302
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA

Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	0.0706604498
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	0.2209078568
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA

Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	0.0001521864
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	0.0903362659
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp6.pFourier
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	0.08402815
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA

Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	0.10857725
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	0.15881392
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA

Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	0.16407159
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA

Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	0.64718977
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	0.27341306
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp6.k
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	1
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	1
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA

Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	1
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	1
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA

Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	1
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	1
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp7.p
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	0.0002003296

Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	0.3669787165
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA

Huntington's disease	NA
Intestinal immune network for IgA production	0.2520118279
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	NA
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA

Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	NA
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	NA
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp7.pFourier
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	0.003731617
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA

Cell adhesion molecules (CAMs)	0.754419935
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	0.227927162
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA

Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	NA
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	NA
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	NA

Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp7.k
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	1
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	1
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA

Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	1
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	NA
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA

RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	NA
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	NA
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp8.p
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	0.0001537627
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA

Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	0.0428435856
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	0.0903362659
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA

Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	NA
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	NA

Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	NA
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp8.pFourier
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	0.02069767
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	0.40434645
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA

Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	0.27341306
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	NA
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA

Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	NA
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	NA
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp8.k
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	1
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA

Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	1
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	1
Legionellosis	NA

Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	NA
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA

Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	NA
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	NA
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp9.p
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	NA
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	0.1574914
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA

Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	NA
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	NA

Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	NA
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	NA
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

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African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	NA
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	0.1890873
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA

Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	NA
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	NA
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA

Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	NA
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	NA
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp9.k
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	NA
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA

Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	1
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	NA
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA

Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	NA
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	NA
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA

Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	NA
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA
	Comp10.p
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	NA
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	0.1260038
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA

Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	NA
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	NA
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA

Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	NA
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	NA
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp10.pFourier
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	NA
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA

Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	0.04547499
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	NA
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA

Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	NA
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA

Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	NA
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	NA
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp10.k
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	NA
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	1
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA

Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	NA
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	NA
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA

Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	NA
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	NA
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp11.p
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA

Allograft rejection	NA
Alzheimer's disease	NA
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	0.09033627
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA

Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	NA
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	NA
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA

Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	NA
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA
Viral carcinogenesis	NA
Viral myocarditis	NA
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp11.pFourier
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	NA
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA

Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	0.2734131
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	NA
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA

Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	NA
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RNA degradation	NA
Salivary secretion	NA
Selenocompound metabolism	NA
Shigellosis	NA
SNARE interactions in vesicular transport	NA
Staphylococcus aureus infection	NA
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	NA
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	NA
Taste transduction	NA
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
Thiamine metabolism	NA
Tight junction	NA
Transcriptional misregulation in cancer	NA
Tryptophan metabolism	NA
Type I diabetes mellitus	NA
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Vasopressin-regulated water reabsorption	NA
Vibrio cholerae infection	NA

Viral carcinogenesis	NA
Viral myocarditis	NA
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA

	Comp11.k
African trypanosomiasis	NA
Alanine, aspartate and glutamate metabolism	NA
Aldosterone-regulated sodium reabsorption	NA
Allograft rejection	NA
Alzheimer's disease	NA
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	NA
Antifolate resistance	NA
Antigen processing and presentation	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	NA
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - other	NA
beta-Alanine metabolism	NA
Bile secretion	NA
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	NA
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	NA
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	1
Chemical carcinogenesis	NA
Citrate cycle (TCA cycle)	NA
Cytosolic DNA-sensing pathway	NA
D-Glutamine and D-glutamate metabolism	NA
Dorso-ventral axis formation	NA
Drug metabolism - other enzymes	NA
Epithelial cell signaling in Helicobacter pylori infection	NA
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid elongation	NA
Ferroptosis	NA
Folate biosynthesis	NA
Galactose metabolism	NA
Gastric acid secretion	NA
Glycine, serine and threonine metabolism	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA

Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
Graft-versus-host disease	NA
Histidine metabolism	NA
Homologous recombination	NA
Huntington's disease	NA
Intestinal immune network for IgA production	NA
Legionellosis	NA
Leishmaniasis	NA
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Lysine biosynthesis	NA
Malaria	NA
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	NA
Mineral absorption	NA
Mucin type O-glycan biosynthesis	NA
Neuroactive ligand-receptor interaction	NA
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
One carbon pool by folate	NA
Ovarian steroidogenesis	NA
Pantothenate and CoA biosynthesis	NA
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	NA
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphonate and phosphinate metabolism	NA
Phototransduction	NA
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	NA
Propanoate metabolism	NA
Protein processing in endoplasmic reticulum	NA
Proximal tubule bicarbonate reclamation	NA
Renin secretion	NA
Renin-angiotensin system	NA
Rheumatoid arthritis	NA

```
Riboflavin metabolism                                                  NA
Ribosome biogenesis in eukaryotes                                      NA
RNA degradation                                                        NA
Salivary secretion                                                     NA
Selenocompound metabolism                                              NA
Shigellosis                                                            NA
SNARE interactions in vesicular transport                              NA
Staphylococcus aureus infection                                        NA
Starch and sucrose metabolism                                          NA
Steroid biosynthesis                                                   NA
Sulfur metabolism                                                      NA
Sulfur relay system                                                    NA
Synaptic vesicle cycle                                                 NA
Synthesis and degradation of ketone bodies                             NA
Systemic lupus erythematosus                                           NA
Taste transduction                                                     NA
Taurine and hypotaurine metabolism                                     NA
Terpenoid backbone biosynthesis                                        NA
Thiamine metabolism                                                    NA
Tight junction                                                         NA
Transcriptional misregulation in cancer                                NA
Tryptophan metabolism                                                  NA
Type I diabetes mellitus                                               NA
Tyrosine metabolism                                                    NA
Ubiquinone and other terpenoid-quinone biosynthesis                    NA
Vasopressin-regulated water reabsorption                               NA
Vibrio cholerae infection                                              NA
Viral carcinogenesis                                                   NA
Viral myocarditis                                                      NA
Vitamin B6 metabolism                                                  NA
Vitamin digestion and absorption                                       NA
```

Apart from the expected arguments: a gene expression data matrix, a vector of class labels and a list of pathways, the user needs to specify the `type` argument which decides on the type of the data (`"MA"` is used for expression microarray and `"RNASeq"` for RNA-Seq data). The others arguments are optional. Arguments `convertTo` and `convertBy` control the conversion of the node labels in the pathways. The default setting is `convertTo="none"` which performs no conversion. Please note, that the node labels should be the same as the rownames of gene expression data matrix. Since, the DEGraph method runs a statistical test for each connected component of a pathway, a method for assigning a global p-value for whole pathway is needed. The user can select from three approaches: the minimum, the mean and the p-value of the biggest component. This is specified via `overall` argument. The implementation returns also a gene-level statistics of the differential expression of genes performed via moderated t-test from `limma` package. These statistics are later used in the

visualization of a selected pathway.

3.3 clipper

The last multivariable method available within this package is called clipper. This method is similar to the topologyGSA as it uses the same two-step approach. However, the Iterative Proportional Scaling algorithm was subsituted with a shrinkage procedure of James-Stein-type which additionally allows proper estimates also in the situation when number of samples is smaller than the number of genes in a pathway. The tests on a pathway-level are follwed with a search for the most affected path in the graph.

The method can be applied with

```
> cli<-clipper(hnrnp.cnts, group, pathways, type="RNASeq", method="mean")
> #530 node labels mapped to the expression data
> #Average coverage 82.98681 %
> #0 (out of 10) pathways without a mapped node
> #1  pathways were filtered out
> #Analysing pathway:
> #
> #Acute myeloid leukemia
> #Adherens junction
> #Adipocytokine signaling pathway
> #Adrenergic signaling in cardiomyocytes
> #African trypanosomiasis
> #Alanine, aspartate and glutamate metabolism
> #Alcoholism
> #Aldosterone-regulated sodium reabsorption
> #Allograft rejection
> #alpha-Linolenic acid metabolism
> res(cli)$results[[1]][1:2,]
> #                       alphaVar alphaMean mean.q.value var.q.value
> #Acute myeloid leukemia    0.026     0.010        0.016       0.033
> #Adherens junction         0.030     0.009        0.016       0.033
>
```

Apart from the expected arguments: a gene expression data matrix, a vector of class labels and a list of pathways, the user needs to specify the `type` argument which decides on the type of the data (`"MA"` is used for expression microarray and `"RNASeq"` for RNA-Seq data). The others arguments are optional. Arguments `convertTo` and `convertBy` control the conversion of the node labels in the pathways. The default setting is `convertTo="none"` which performs no conversion. Please note, that the node labels should be the same as the rownames of gene expression data matrix. Also, both mean and variance tests are run, this can be changed to only variance test by setting `method="var"`. The `nperm` controls the number of permutations in the statistical tests. Similarly

as in topologyGSA, the implementation allows testing of all the cliques present in the graph by setting `testCliques=TRUE`. Please note that these tests may take quite a long time. The implementation returns also a gene-level statistics of the differential expression of genes performed via moderated t-test from `limma` package. These statistics are later used in the visualization of a selected pathway.

3.4 SPIA

The most well-known topology-based pathway analysis method is SPIA. In there, two evidences of differential expression of a pathway are combined. The first evidence is a regular so called overrepresentation analysis in which the statistical significance of the number of differentially expressed genes belonging to a pathway is assessed. The second evidence reflects the pathway topology and it is called the pertubation factor. The authors assume that a differentially expressed gene at the begining of a pathway topology (e.g. a receptor in a signaling pathway) has a stronger effect on the functionality of a pathway than a differentially expressed gene at the end of a pathway (e.g. a transcription factor in a signaling pathway). The pertubation factors of all genes are calculated from a system of linear equations and then combined within a pathway. The two evidences in a form of p-values are finally combined into a global p-value, which is used to rank the pathways.

```
> spi<-SPIA(hnrnp.cnts, group, pathways, type="RNASeq", logFC.th=-1)

15481 node labels mapped to the expression data
Average coverage 85.24048 %
0 (out of 285) pathways without a mapped node

> res(spi)

$results
                                                                pSize
Acute myeloid leukemia                                             50
Adherens junction                                                  65
Adipocytokine signaling pathway                                    56
Adrenergic signaling in cardiomyocytes                            119
African trypanosomiasis                                            20
AGE-RAGE signaling pathway in diabetic complications               85
Alanine, aspartate and glutamate metabolism                        30
Aldosterone synthesis and secretion                                55
Aldosterone-regulated sodium reabsorption                          25
Allograft rejection                                                15
alpha-Linolenic acid metabolism                                    15
Alzheimer's disease                                                45
Amino sugar and nucleotide sugar metabolism                        40
```

Aminoacyl-tRNA biosynthesis	13
Amoebiasis	34
Amphetamine addiction	52
AMPK signaling pathway	86
Amyotrophic lateral sclerosis (ALS)	34
Antifolate resistance	8
Antigen processing and presentation	33
Apelin signaling pathway	115
Apoptosis	119
Arachidonic acid metabolism	39
Arginine and proline metabolism	45
Arginine biosynthesis	18
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	9
Ascorbate and aldarate metabolism	7
Asthma	3
Autoimmune thyroid disease	7
Autophagy - animal	115
Autophagy - other	21
B cell receptor signaling pathway	64
Bacterial invasion of epithelial cells	51
Basal cell carcinoma	41
beta-Alanine metabolism	28
Bile secretion	20
Biosynthesis of unsaturated fatty acids	6
Biotin metabolism	2
Bladder cancer	29
Breast cancer	123
Butanoate metabolism	20
Caffeine metabolism	3
Carbohydrate digestion and absorption	14
Cardiac muscle contraction	10
Cell adhesion molecules (CAMs)	67
Cell cycle	123
Central carbon metabolism in cancer	55
Chagas disease (American trypanosomiasis)	77
Chemical carcinogenesis	38
Choline metabolism in cancer	72
Cholinergic synapse	78
Chronic myeloid leukemia	69
Circadian entrainment	76
Circadian rhythm	29
Citrate cycle (TCA cycle)	29
Cocaine addiction	35
Colorectal cancer	45
Complement and coagulation cascades	38
Cysteine and methionine metabolism	35

Cytosolic DNA-sensing pathway	18
D-Glutamine and D-glutamate metabolism	4
Dilated cardiomyopathy	61
Dopaminergic synapse	106
Dorso-ventral axis formation	13
Drug metabolism - cytochrome P450	39
Drug metabolism - other enzymes	27
ECM-receptor interaction	69
EGFR tyrosine kinase inhibitor resistance	74
Endocrine and other factor-regulated calcium reabsorption	32
Endocrine resistance	89
Endocytosis	94
Endometrial cancer	42
Epithelial cell signaling in Helicobacter pylori infection	32
Epstein-Barr virus infection	76
ErbB signaling pathway	77
Estrogen signaling pathway	78
Ether lipid metabolism	33
Fanconi anemia pathway	38
Fat digestion and absorption	8
Fatty acid biosynthesis	12
Fatty acid degradation	34
Fatty acid elongation	24
Fc epsilon RI signaling pathway	51
Fc gamma R-mediated phagocytosis	81
Ferroptosis	11
Fluid shear stress and atherosclerosis	124
Folate biosynthesis	15
FoxO signaling pathway	115
Fructose and mannose metabolism	31
GABAergic synapse	45
Galactose metabolism	20
Gap junction	74
Gastric acid secretion	48
Glioma	60
Glucagon signaling pathway	77
Glutamatergic synapse	70
Glutathione metabolism	40
Glycerolipid metabolism	45
Glycerophospholipid metabolism	80
Glycine, serine and threonine metabolism	31
Glycolysis / Gluconeogenesis	56
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	9
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	5
Glycosaminoglycan degradation	18
Glycosphingolipid biosynthesis - ganglio series	12

Glycosphingolipid biosynthesis - globo and isoglobo series	11
Glycosphingolipid biosynthesis - lacto and neolacto series	21
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	23
Glyoxylate and dicarboxylate metabolism	23
GnRH signaling pathway	77
Graft-versus-host disease	11
Hedgehog signaling pathway	42
Hepatitis B	116
Hepatitis C	80
Herpes simplex infection	87
HIF-1 signaling pathway	90
Hippo signaling pathway -multiple species	25
Histidine metabolism	21
Homologous recombination	18
Huntington's disease	26
Hypertrophic cardiomyopathy (HCM)	22
IL-17 signaling pathway	14
Inflammatory bowel disease (IBD)	33
Inflammatory mediator regulation of TRP channels	73
Influenza A	96
Inositol phosphate metabolism	64
Insulin resistance	85
Insulin secretion	43
Insulin signaling pathway	124
Intestinal immune network for IgA production	20
Legionellosis	37
Leishmaniasis	44
Leukocyte transendothelial migration	72
Linoleic acid metabolism	16
Lipoic acid metabolism	3
Long-term depression	47
Long-term potentiation	56
Longevity regulating pathway	70
Longevity regulating pathway - multiple species	54
Lysine biosynthesis	2
Lysine degradation	52
Malaria	10
Mannose type O-glycan biosynthesis	19
Maturity onset diabetes of the young	11
Measles	74
Melanogenesis	88
Melanoma	56
Metabolism of xenobiotics by cytochrome P450	43
Mineral absorption	4
Mitophagy - animal	61
Morphine addiction	43

mRNA surveillance pathway	63
mTOR signaling pathway	131
Mucin type O-glycan biosynthesis	24
N-Glycan biosynthesis	46
Natural killer cell mediated cytotoxicity	88
Neuroactive ligand-receptor interaction	14
Neurotrophin signaling pathway	106
NF-kappa B signaling pathway	71
Nicotinate and nicotinamide metabolism	23
Nitrogen metabolism	4
NOD-like receptor signaling pathway	119
Non-alcoholic fatty liver disease (NAFLD)	68
Non-small cell lung cancer	54
Notch signaling pathway	46
One carbon pool by folate	18
Oocyte meiosis	103
Osteoclast differentiation	96
Ovarian steroidogenesis	26
Oxidative phosphorylation	40
p53 signaling pathway	67
Pancreatic cancer	62
Pancreatic secretion	24
Pantothenate and CoA biosynthesis	11
Parkinson's disease	26
Pathogenic Escherichia coli infection	39
Pentose and glucuronate interconversions	18
Pentose phosphate pathway	28
Peroxisome	8
Pertussis	45
Phagosome	29
Phenylalanine metabolism	12
Phenylalanine, tyrosine and tryptophan biosynthesis	3
Phosphatidylinositol signaling system	78
Phospholipase D signaling pathway	91
Phosphonate and phosphinate metabolism	6
Phototransduction	22
Platelet activation	95
Platinum drug resistance	38
Porphyrin and chlorophyll metabolism	24
Primary bile acid biosynthesis	14
Prion diseases	20
Progesterone-mediated oocyte maturation	74
Prolactin signaling pathway	61
Propanoate metabolism	30
Prostate cancer	79
Protein processing in endoplasmic reticulum	50

Proximal tubule bicarbonate reclamation	7
Pyrimidine metabolism	96
Pyruvate metabolism	36
Regulation of lipolysis in adipocytes	42
Renal cell carcinoma	52
Renin secretion	40
Renin-angiotensin system	2
Retinol metabolism	39
Retrograde endocannabinoid signaling	88
Rheumatoid arthritis	13
Riboflavin metabolism	6
Ribosome biogenesis in eukaryotes	3
RIG-I-like receptor signaling pathway	48
RNA degradation	14
RNA transport	122
Salivary secretion	37
Salmonella infection	69
Selenocompound metabolism	14
Serotonergic synapse	63
Shigellosis	48
Signaling pathways regulating pluripotency of stem cells	102
Small cell lung cancer	79
SNARE interactions in vesicular transport	26
Sphingolipid metabolism	44
Sphingolipid signaling pathway	91
Staphylococcus aureus infection	24
Starch and sucrose metabolism	23
Steroid biosynthesis	20
Steroid hormone biosynthesis	34
Sulfur metabolism	9
Sulfur relay system	8
Synaptic vesicle cycle	18
Synthesis and degradation of ketone bodies	9
Systemic lupus erythematosus	13
T cell receptor signaling pathway	79
Taste transduction	24
Taurine and hypotaurine metabolism	8
Terpenoid backbone biosynthesis	21
TGF-beta signaling pathway	69
Th1 and Th2 cell differentiation	68
Th17 cell differentiation	77
Thiamine metabolism	14
Thyroid cancer	26
Thyroid hormone signaling pathway	102
Thyroid hormone synthesis	39
Tight junction	4

TNF signaling pathway	69
Toll-like receptor signaling pathway	76
Toxoplasmosis	79
Transcriptional misregulation in cancer	17
Tryptophan metabolism	36
Type I diabetes mellitus	4
Type II diabetes mellitus	39
Tyrosine metabolism	24
Ubiquinone and other terpenoid-quinone biosynthesis	9
Valine, leucine and isoleucine degradation	45
Vascular smooth muscle contraction	88
Vasopressin-regulated water reabsorption	20
VEGF signaling pathway	53
Vibrio cholerae infection	15
Viral carcinogenesis	6
Viral myocarditis	26
Vitamin B6 metabolism	5
Vitamin digestion and absorption	2
Wnt signaling pathway	124
	NDE
Acute myeloid leukemia	20
Adherens junction	33
Adipocytokine signaling pathway	20
Adrenergic signaling in cardiomyocytes	40
African trypanosomiasis	3
AGE-RAGE signaling pathway in diabetic complications	32
Alanine, aspartate and glutamate metabolism	11
Aldosterone synthesis and secretion	20
Aldosterone-regulated sodium reabsorption	9
Allograft rejection	6
alpha-Linolenic acid metabolism	6
Alzheimer's disease	21
Amino sugar and nucleotide sugar metabolism	20
Aminoacyl-tRNA biosynthesis	6
Amoebiasis	10
Amphetamine addiction	21
AMPK signaling pathway	42
Amyotrophic lateral sclerosis (ALS)	18
Antifolate resistance	1
Antigen processing and presentation	16
Apelin signaling pathway	34
Apoptosis	48
Arachidonic acid metabolism	15
Arginine and proline metabolism	15
Arginine biosynthesis	6
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	5

Ascorbate and aldarate metabolism	0
Asthma	0
Autoimmune thyroid disease	0
Autophagy - animal	57
Autophagy - other	9
B cell receptor signaling pathway	23
Bacterial invasion of epithelial cells	15
Basal cell carcinoma	20
beta-Alanine metabolism	12
Bile secretion	5
Biosynthesis of unsaturated fatty acids	3
Biotin metabolism	0
Bladder cancer	15
Breast cancer	50
Butanoate metabolism	6
Caffeine metabolism	1
Carbohydrate digestion and absorption	6
Cardiac muscle contraction	4
Cell adhesion molecules (CAMs)	19
Cell cycle	61
Central carbon metabolism in cancer	24
Chagas disease (American trypanosomiasis)	29
Chemical carcinogenesis	11
Choline metabolism in cancer	32
Cholinergic synapse	22
Chronic myeloid leukemia	28
Circadian entrainment	23
Circadian rhythm	10
Citrate cycle (TCA cycle)	15
Cocaine addiction	12
Colorectal cancer	23
Complement and coagulation cascades	19
Cysteine and methionine metabolism	14
Cytosolic DNA-sensing pathway	7
D-Glutamine and D-glutamate metabolism	2
Dilated cardiomyopathy	15
Dopaminergic synapse	34
Dorso-ventral axis formation	7
Drug metabolism - cytochrome P450	10
Drug metabolism - other enzymes	13
ECM-receptor interaction	31
EGFR tyrosine kinase inhibitor resistance	35
Endocrine and other factor-regulated calcium reabsorption	7
Endocrine resistance	37
Endocytosis	34
Endometrial cancer	19

Epithelial cell signaling in Helicobacter pylori infection	15
Epstein-Barr virus infection	28
ErbB signaling pathway	30
Estrogen signaling pathway	30
Ether lipid metabolism	11
Fanconi anemia pathway	20
Fat digestion and absorption	5
Fatty acid biosynthesis	4
Fatty acid degradation	15
Fatty acid elongation	7
Fc epsilon RI signaling pathway	20
Fc gamma R-mediated phagocytosis	30
Ferroptosis	2
Fluid shear stress and atherosclerosis	53
Folate biosynthesis	10
FoxO signaling pathway	49
Fructose and mannose metabolism	22
GABAergic synapse	9
Galactose metabolism	13
Gap junction	24
Gastric acid secretion	14
Glioma	24
Glucagon signaling pathway	24
Glutamatergic synapse	20
Glutathione metabolism	17
Glycerolipid metabolism	25
Glycerophospholipid metabolism	42
Glycine, serine and threonine metabolism	15
Glycolysis / Gluconeogenesis	24
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	7
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	2
Glycosaminoglycan degradation	11
Glycosphingolipid biosynthesis - ganglio series	6
Glycosphingolipid biosynthesis - globo and isoglobo series	4
Glycosphingolipid biosynthesis - lacto and neolacto series	4
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	10
Glyoxylate and dicarboxylate metabolism	12
GnRH signaling pathway	30
Graft-versus-host disease	5
Hedgehog signaling pathway	13
Hepatitis B	48
Hepatitis C	39
Herpes simplex infection	38
HIF-1 signaling pathway	35
Hippo signaling pathway -multiple species	6
Histidine metabolism	8

Homologous recombination	10
Huntington's disease	13
Hypertrophic cardiomyopathy (HCM)	7
IL-17 signaling pathway	3
Inflammatory bowel disease (IBD)	6
Inflammatory mediator regulation of TRP channels	25
Influenza A	32
Inositol phosphate metabolism	22
Insulin resistance	29
Insulin secretion	12
Insulin signaling pathway	48
Intestinal immune network for IgA production	5
Legionellosis	10
Leishmaniasis	15
Leukocyte transendothelial migration	26
Linoleic acid metabolism	4
Lipoic acid metabolism	1
Long-term depression	16
Long-term potentiation	23
Longevity regulating pathway	24
Longevity regulating pathway - multiple species	20
Lysine biosynthesis	1
Lysine degradation	17
Malaria	1
Mannose type O-glycan biosynthesis	8
Maturity onset diabetes of the young	4
Measles	24
Melanogenesis	32
Melanoma	21
Metabolism of xenobiotics by cytochrome P450	15
Mineral absorption	1
Mitophagy - animal	22
Morphine addiction	6
mRNA surveillance pathway	38
mTOR signaling pathway	61
Mucin type O-glycan biosynthesis	8
N-Glycan biosynthesis	19
Natural killer cell mediated cytotoxicity	34
Neuroactive ligand-receptor interaction	5
Neurotrophin signaling pathway	39
NF-kappa B signaling pathway	20
Nicotinate and nicotinamide metabolism	13
Nitrogen metabolism	2
NOD-like receptor signaling pathway	52
Non-alcoholic fatty liver disease (NAFLD)	28
Non-small cell lung cancer	21

Notch signaling pathway	17
One carbon pool by folate	9
Oocyte meiosis	47
Osteoclast differentiation	34
Ovarian steroidogenesis	8
Oxidative phosphorylation	22
p53 signaling pathway	25
Pancreatic cancer	29
Pancreatic secretion	6
Pantothenate and CoA biosynthesis	5
Parkinson's disease	7
Pathogenic Escherichia coli infection	8
Pentose and glucuronate interconversions	6
Pentose phosphate pathway	17
Peroxisome	5
Pertussis	17
Phagosome	6
Phenylalanine metabolism	6
Phenylalanine, tyrosine and tryptophan biosynthesis	1
Phosphatidylinositol signaling system	27
Phospholipase D signaling pathway	32
Phosphonate and phosphinate metabolism	2
Phototransduction	5
Platelet activation	32
Platinum drug resistance	15
Porphyrin and chlorophyll metabolism	6
Primary bile acid biosynthesis	5
Prion diseases	8
Progesterone-mediated oocyte maturation	32
Prolactin signaling pathway	25
Propanoate metabolism	11
Prostate cancer	39
Protein processing in endoplasmic reticulum	21
Proximal tubule bicarbonate reclamation	3
Pyrimidine metabolism	36
Pyruvate metabolism	16
Regulation of lipolysis in adipocytes	12
Renal cell carcinoma	26
Renin secretion	13
Renin-angiotensin system	0
Retinol metabolism	12
Retrograde endocannabinoid signaling	30
Rheumatoid arthritis	2
Riboflavin metabolism	3
Ribosome biogenesis in eukaryotes	1
RIG-I-like receptor signaling pathway	26

RNA degradation	6
RNA transport	55
Salivary secretion	10
Salmonella infection	22
Selenocompound metabolism	5
Serotonergic synapse	15
Shigellosis	14
Signaling pathways regulating pluripotency of stem cells	41
Small cell lung cancer	36
SNARE interactions in vesicular transport	9
Sphingolipid metabolism	20
Sphingolipid signaling pathway	35
Staphylococcus aureus infection	10
Starch and sucrose metabolism	11
Steroid biosynthesis	5
Steroid hormone biosynthesis	10
Sulfur metabolism	2
Sulfur relay system	2
Synaptic vesicle cycle	10
Synthesis and degradation of ketone bodies	3
Systemic lupus erythematosus	4
T cell receptor signaling pathway	31
Taste transduction	5
Taurine and hypotaurine metabolism	3
Terpenoid backbone biosynthesis	8
TGF-beta signaling pathway	29
Th1 and Th2 cell differentiation	20
Th17 cell differentiation	23
Thiamine metabolism	8
Thyroid cancer	13
Thyroid hormone signaling pathway	39
Thyroid hormone synthesis	12
Tight junction	2
TNF signaling pathway	27
Toll-like receptor signaling pathway	25
Toxoplasmosis	28
Transcriptional misregulation in cancer	5
Tryptophan metabolism	14
Type I diabetes mellitus	0
Type II diabetes mellitus	13
Tyrosine metabolism	8
Ubiquinone and other terpenoid-quinone biosynthesis	3
Valine, leucine and isoleucine degradation	16
Vascular smooth muscle contraction	31
Vasopressin-regulated water reabsorption	7
VEGF signaling pathway	19

Vibrio cholerae infection	2
Viral carcinogenesis	2
Viral myocarditis	9
Vitamin B6 metabolism	3
Vitamin digestion and absorption	0
Wnt signaling pathway	45
	pNDE
Acute myeloid leukemia	0.381
Adherens junction	0.016
Adipocytokine signaling pathway	0.629
Adrenergic signaling in cardiomyocytes	0.806
African trypanosomiasis	0.992
AGE-RAGE signaling pathway in diabetic complications	0.493
Alanine, aspartate and glutamate metabolism	0.584
Aldosterone synthesis and secretion	0.590
Aldosterone-regulated sodium reabsorption	0.616
Allograft rejection	0.501
alpha-Linolenic acid metabolism	0.501
Alzheimer's disease	0.118
Amino sugar and nucleotide sugar metabolism	0.064
Aminoacyl-tRNA biosynthesis	0.339
Amoebiasis	0.864
Amphetamine addiction	0.355
AMPK signaling pathway	0.016
Amyotrophic lateral sclerosis (ALS)	0.042
Antifolate resistance	0.975
Antigen processing and presentation	0.119
Apelin signaling pathway	0.962
Apoptosis	0.254
Arachidonic acid metabolism	0.486
Arginine and proline metabolism	0.745
Arginine biosynthesis	0.709
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.207
Ascorbate and aldarate metabolism	1.000
Asthma	1.000
Autoimmune thyroid disease	1.000
Autophagy - animal	0.004
Autophagy - other	0.365
B cell receptor signaling pathway	0.617
Bacterial invasion of epithelial cells	0.900
Basal cell carcinoma	0.082
beta-Alanine metabolism	0.323
Bile secretion	0.914
Biosynthesis of unsaturated fatty acids	0.394
Biotin metabolism	1.000
Bladder cancer	0.075

Breast cancer	0.227
Butanoate metabolism	0.809
Caffeine metabolism	0.750
Carbohydrate digestion and absorption	0.421
Cardiac muscle contraction	0.540
Cell adhesion molecules (CAMs)	0.947
Cell cycle	0.003
Central carbon metabolism in cancer	0.189
Chagas disease (American trypanosomiasis)	0.496
Chemical carcinogenesis	0.886
Choline metabolism in cancer	0.118
Cholinergic synapse	0.961
Chronic myeloid leukemia	0.309
Circadian entrainment	0.912
Circadian rhythm	0.677
Citrate cycle (TCA cycle)	0.075
Cocaine addiction	0.690
Colorectal cancer	0.037
Complement and coagulation cascades	0.070
Cysteine and methionine metabolism	0.419
Cytosolic DNA-sensing pathway	0.523
D-Glutamine and D-glutamate metabolism	0.473
Dilated cardiomyopathy	0.986
Dopaminergic synapse	0.877
Dorso-ventral axis formation	0.166
Drug metabolism - cytochrome P450	0.953
Drug metabolism - other enzymes	0.159
ECM-receptor interaction	0.108
EGFR tyrosine kinase inhibitor resistance	0.045
Endocrine and other factor-regulated calcium reabsorption	0.979
Endocrine resistance	0.216
Endocytosis	0.606
Endometrial cancer	0.172
Epithelial cell signaling in Helicobacter pylori infection	0.165
Epstein-Barr virus infection	0.555
ErbB signaling pathway	0.403
Estrogen signaling pathway	0.437
Ether lipid metabolism	0.728
Fanconi anemia pathway	0.036
Fat digestion and absorption	0.131
Fatty acid biosynthesis	0.706
Fatty acid degradation	0.245
Fatty acid elongation	0.843
Fc epsilon RI signaling pathway	0.423
Fc gamma R-mediated phagocytosis	0.540
Ferroptosis	0.954

Fluid shear stress and atherosclerosis	0.109
Folate biosynthesis	0.019
FoxO signaling pathway	0.125
Fructose and mannose metabolism	0.000
GABAergic synapse	0.996
Galactose metabolism	0.010
Gap junction	0.826
Gastric acid secretion	0.901
Glioma	0.361
Glucagon signaling pathway	0.882
Glutamatergic synapse	0.946
Glutathione metabolism	0.286
Glycerolipid metabolism	0.009
Glycerophospholipid metabolism	0.003
Glycine, serine and threonine metabolism	0.131
Glycolysis / Gluconeogenesis	0.220
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.016
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.610
Glycosaminoglycan degradation	0.033
Glycosphingolipid biosynthesis - ganglio series	0.259
Glycosphingolipid biosynthesis - globo and isoglobo series	0.629
Glycosphingolipid biosynthesis - lacto and neolacto series	0.978
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.330
Glyoxylate and dicarboxylate metabolism	0.100
GnRH signaling pathway	0.403
Graft-versus-host disease	0.385
Hedgehog signaling pathway	0.835
Hepatitis B	0.189
Hepatitis C	0.021
Herpes simplex infection	0.120
HIF-1 signaling pathway	0.394
Hippo signaling pathway -multiple species	0.944
Histidine metabolism	0.541
Homologous recombination	0.085
Huntington's disease	0.122
Hypertrophic cardiomyopathy (HCM)	0.763
IL-17 signaling pathway	0.937
Inflammatory bowel disease (IBD)	0.995
Inflammatory mediator regulation of TRP channels	0.727
Influenza A	0.803
Inositol phosphate metabolism	0.712
Insulin resistance	0.746
Insulin secretion	0.921
Insulin signaling pathway	0.379
Intestinal immune network for IgA production	0.914
Legionellosis	0.926

Leishmaniasis	0.708
Leukocyte transendothelial migration	0.607
Linoleic acid metabolism	0.899
Lipoic acid metabolism	0.750
Long-term depression	0.714
Long-term potentiation	0.308
Longevity regulating pathway	0.722
Longevity regulating pathway - multiple species	0.550
Lysine biosynthesis	0.603
Lysine degradation	0.784
Malaria	0.990
Mannose type O-glycan biosynthesis	0.405
Maturity onset diabetes of the young	0.629
Measles	0.826
Melanogenesis	0.590
Melanoma	0.520
Metabolism of xenobiotics by cytochrome P450	0.668
Mineral absorption	0.843
Mitophagy - animal	0.608
Morphine addiction	1.000
mRNA surveillance pathway	0.000
mTOR signaling pathway	0.015
Mucin type O-glycan biosynthesis	0.716
N-Glycan biosynthesis	0.322
Natural killer cell mediated cytotoxicity	0.415
Neuroactive ligand-receptor interaction	0.638
Neurotrophin signaling pathway	0.555
NF-kappa B signaling pathway	0.955
Nicotinate and nicotinamide metabolism	0.045
Nitrogen metabolism	0.473
NOD-like receptor signaling pathway	0.079
Non-alcoholic fatty liver disease (NAFLD)	0.276
Non-small cell lung cancer	0.438
Notch signaling pathway	0.559
One carbon pool by folate	0.184
Oocyte meiosis	0.044
Osteoclast differentiation	0.664
Ovarian steroidogenesis	0.804
Oxidative phosphorylation	0.015
p53 signaling pathway	0.526
Pancreatic cancer	0.073
Pancreatic secretion	0.928
Pantothenate and CoA biosynthesis	0.385
Parkinson's disease	0.900
Pathogenic Escherichia coli infection	0.992
Pentose and glucuronate interconversions	0.709

Pentose phosphate pathway	0.009
Peroxisome	0.131
Pertussis	0.514
Phagosome	0.982
Phenylalanine metabolism	0.259
Phenylalanine, tyrosine and tryptophan biosynthesis	0.750
Phosphatidylinositol signaling system	0.709
Phospholipase D signaling pathway	0.680
Phosphonate and phosphinate metabolism	0.717
Phototransduction	0.951
Platelet activation	0.781
Platinum drug resistance	0.436
Porphyrin and chlorophyll metabolism	0.928
Primary bile acid biosynthesis	0.638
Prion diseases	0.474
Progesterone-mediated oocyte maturation	0.161
Prolactin signaling pathway	0.302
Propanoate metabolism	0.584
Prostate cancer	0.016
Protein processing in endoplasmic reticulum	0.277
Proximal tubule bicarbonate reclamation	0.514
Pyrimidine metabolism	0.499
Pyruvate metabolism	0.224
Regulation of lipolysis in adipocytes	0.904
Renal cell carcinoma	0.038
Renin secretion	0.773
Renin-angiotensin system	1.000
Retinol metabolism	0.835
Retrograde endocannabinoid signaling	0.750
Rheumatoid arthritis	0.979
Riboflavin metabolism	0.394
Ribosome biogenesis in eukaryotes	0.750
RIG-I-like receptor signaling pathway	0.011
RNA degradation	0.421
RNA transport	0.040
Salivary secretion	0.926
Salmonella infection	0.844
Selenocompound metabolism	0.638
Serotonergic synapse	0.991
Shigellosis	0.901
Signaling pathways regulating pluripotency of stem cells	0.284
Small cell lung cancer	0.073
SNARE interactions in vesicular transport	0.670
Sphingolipid metabolism	0.157
Sphingolipid signaling pathway	0.426
Staphylococcus aureus infection	0.391

Starch and sucrose metabolism	0.194
Steroid biosynthesis	0.914
Steroid hormone biosynthesis	0.864
Sulfur metabolism	0.902
Sulfur relay system	0.859
Synaptic vesicle cycle	0.085
Synthesis and degradation of ketone bodies	0.708
Systemic lupus erythematosus	0.770
T cell receptor signaling pathway	0.381
Taste transduction	0.973
Taurine and hypotaurine metabolism	0.619
Terpenoid backbone biosynthesis	0.541
TGF-beta signaling pathway	0.228
Th1 and Th2 cell differentiation	0.925
Th17 cell differentiation	0.924
Thiamine metabolism	0.101
Thyroid cancer	0.122
Thyroid hormone signaling pathway	0.435
Thyroid hormone synthesis	0.835
Tight junction	0.473
TNF signaling pathway	0.401
Toll-like receptor signaling pathway	0.805
Toxoplasmosis	0.654
Transcriptional misregulation in cancer	0.815
Tryptophan metabolism	0.470
Type I diabetes mellitus	1.000
Type II diabetes mellitus	0.737
Tyrosine metabolism	0.716
Ubiquinone and other terpenoid-quinone biosynthesis	0.708
Valine, leucine and isoleucine degradation	0.635
Vascular smooth muscle contraction	0.674
Vasopressin-regulated water reabsorption	0.655
VEGF signaling pathway	0.620
Vibrio cholerae infection	0.990
Viral carcinogenesis	0.717
Viral myocarditis	0.670
Vitamin B6 metabolism	0.267
Vitamin digestion and absorption	1.000
Wnt signaling pathway	0.600

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Acute myeloid leukemia	-9811.458
Adherens junction	-23102.146
Adipocytokine signaling pathway	-16355.516
Adrenergic signaling in cardiomyocytes	-9200.234
African trypanosomiasis	-585.250
AGE-RAGE signaling pathway in diabetic complications	-9951.113

Alanine, aspartate and glutamate metabolism	0.000
Aldosterone synthesis and secretion	8956.568
Aldosterone-regulated sodium reabsorption	523.500
Allograft rejection	0.000
alpha-Linolenic acid metabolism	0.000
Alzheimer's disease	-23149.125
Amino sugar and nucleotide sugar metabolism	0.000
Aminoacyl-tRNA biosynthesis	0.000
Amoebiasis	-284.750
Amphetamine addiction	-48.725
AMPK signaling pathway	9449.607
Amyotrophic lateral sclerosis (ALS)	-37455.875
Antifolate resistance	1030.000
Antigen processing and presentation	-14916.625
Apelin signaling pathway	-2817.581
Apoptosis	-2395.612
Arachidonic acid metabolism	0.000
Arginine and proline metabolism	0.000
Arginine biosynthesis	0.000
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	3006.750
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - animal	19309.845
Autophagy - other	3450.328
B cell receptor signaling pathway	4476.813
Bacterial invasion of epithelial cells	-6784.250
Basal cell carcinoma	-10153.779
beta-Alanine metabolism	0.000
Bile secretion	-23.000
Biosynthesis of unsaturated fatty acids	0.000
Biotin metabolism	NA
Bladder cancer	-6329.875
Breast cancer	44633.867
Butanoate metabolism	0.000
Caffeine metabolism	0.000
Carbohydrate digestion and absorption	356.750
Cardiac muscle contraction	0.000
Cell adhesion molecules (CAMs)	-10534.750
Cell cycle	13109.988
Central carbon metabolism in cancer	-21018.426
Chagas disease (American trypanosomiasis)	-33666.473
Chemical carcinogenesis	0.000
Choline metabolism in cancer	-5382.258
Cholinergic synapse	3222.328
Chronic myeloid leukemia	-13088.479

Circadian entrainment	9442.193
Circadian rhythm	-1432.114
Citrate cycle (TCA cycle)	0.000
Cocaine addiction	-1012.453
Colorectal cancer	27055.733
Complement and coagulation cascades	-2858.779
Cysteine and methionine metabolism	0.000
Cytosolic DNA-sensing pathway	-1620.625
D-Glutamine and D-glutamate metabolism	0.000
Dilated cardiomyopathy	0.000
Dopaminergic synapse	-3193.722
Dorso-ventral axis formation	4538.250
Drug metabolism - cytochrome P450	0.000
Drug metabolism - other enzymes	0.000
ECM-receptor interaction	-159134.625
EGFR tyrosine kinase inhibitor resistance	-190.634
Endocrine and other factor-regulated calcium reabsorption	9012.000
Endocrine resistance	-13210.417
Endocytosis	0.000
Endometrial cancer	22031.964
Epithelial cell signaling in Helicobacter pylori infection	7448.333
Epstein-Barr virus infection	8230.876
ErbB signaling pathway	-14851.123
Estrogen signaling pathway	-13670.990
Ether lipid metabolism	0.000
Fanconi anemia pathway	-2707.750
Fat digestion and absorption	0.000
Fatty acid biosynthesis	0.000
Fatty acid degradation	0.000
Fatty acid elongation	0.000
Fc epsilon RI signaling pathway	-6533.492
Fc gamma R-mediated phagocytosis	3655.730
Ferroptosis	0.000
Fluid shear stress and atherosclerosis	-15486.624
Folate biosynthesis	0.000
FoxO signaling pathway	-6626.140
Fructose and mannose metabolism	0.000
GABAergic synapse	299.641
Galactose metabolism	0.000
Gap junction	921.875
Gastric acid secretion	3049.375
Glioma	2952.000
Glucagon signaling pathway	1449.616
Glutamatergic synapse	2807.155
Glutathione metabolism	0.000
Glycerolipid metabolism	0.000

Glycerophospholipid metabolism	0.000
Glycine, serine and threonine metabolism	0.000
Glycolysis / Gluconeogenesis	0.000
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.000
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.000
Glycosaminoglycan degradation	0.000
Glycosphingolipid biosynthesis - ganglio series	0.000
Glycosphingolipid biosynthesis - globo and isoglobo series	0.000
Glycosphingolipid biosynthesis - lacto and neolacto series	0.000
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.000
Glyoxylate and dicarboxylate metabolism	0.000
GnRH signaling pathway	28367.500
Graft-versus-host disease	0.000
Hedgehog signaling pathway	-1737.167
Hepatitis B	-40672.614
Hepatitis C	31.819
Herpes simplex infection	-30047.083
HIF-1 signaling pathway	92.232
Hippo signaling pathway -multiple species	1290.958
Histidine metabolism	0.000
Homologous recombination	0.000
Huntington's disease	2507.500
Hypertrophic cardiomyopathy (HCM)	0.000
IL-17 signaling pathway	53.375
Inflammatory bowel disease (IBD)	1319.245
Inflammatory mediator regulation of TRP channels	-4763.427
Influenza A	1380.584
Inositol phosphate metabolism	0.000
Insulin resistance	59001.544
Insulin secretion	-1978.794
Insulin signaling pathway	50373.773
Intestinal immune network for IgA production	309.000
Legionellosis	2306.625
Leishmaniasis	10167.383
Leukocyte transendothelial migration	-19832.893
Linoleic acid metabolism	0.000
Lipoic acid metabolism	0.000
Long-term depression	NA
Long-term potentiation	-8565.289
Longevity regulating pathway	18557.879
Longevity regulating pathway - multiple species	4148.277
Lysine biosynthesis	0.000
Lysine degradation	0.000
Malaria	0.000
Mannose type O-glycan biosynthesis	0.000
Maturity onset diabetes of the young	516.688

Measles	9485.575
Melanogenesis	-15944.424
Melanoma	4426.875
Metabolism of xenobiotics by cytochrome P450	0.000
Mineral absorption	-408.500
Mitophagy - animal	7610.201
Morphine addiction	16.646
mRNA surveillance pathway	0.000
mTOR signaling pathway	13974.677
Mucin type O-glycan biosynthesis	0.000
N-Glycan biosynthesis	0.000
Natural killer cell mediated cytotoxicity	14182.477
Neuroactive ligand-receptor interaction	139.125
Neurotrophin signaling pathway	16922.458
NF-kappa B signaling pathway	-21267.069
Nicotinate and nicotinamide metabolism	0.000
Nitrogen metabolism	0.000
NOD-like receptor signaling pathway	85.820
Non-alcoholic fatty liver disease (NAFLD)	851.525
Non-small cell lung cancer	-13232.714
Notch signaling pathway	25399.607
One carbon pool by folate	0.000
Oocyte meiosis	9274.468
Osteoclast differentiation	-33958.511
Ovarian steroidogenesis	205.000
Oxidative phosphorylation	0.000
p53 signaling pathway	3536.691
Pancreatic cancer	-2234.162
Pancreatic secretion	-23.000
Pantothenate and CoA biosynthesis	0.000
Parkinson's disease	-42496.375
Pathogenic Escherichia coli infection	99199.125
Pentose and glucuronate interconversions	0.000
Pentose phosphate pathway	0.000
Peroxisome	0.000
Pertussis	-2924.806
Phagosome	0.000
Phenylalanine metabolism	0.000
Phenylalanine, tyrosine and tryptophan biosynthesis	0.000
Phosphatidylinositol signaling system	0.000
Phospholipase D signaling pathway	16755.766
Phosphonate and phosphinate metabolism	0.000
Phototransduction	-2862.375
Platelet activation	5071.468
Platinum drug resistance	-6976.324
Porphyrin and chlorophyll metabolism	0.000

Primary bile acid biosynthesis	0.000
Prion diseases	-11287.857
Progesterone-mediated oocyte maturation	141813.375
Prolactin signaling pathway	-14595.616
Propanoate metabolism	0.000
Prostate cancer	75594.650
Protein processing in endoplasmic reticulum	9260.833
Proximal tubule bicarbonate reclamation	0.000
Pyrimidine metabolism	0.000
Pyruvate metabolism	0.000
Regulation of lipolysis in adipocytes	-7969.125
Renal cell carcinoma	-5990.281
Renin secretion	3171.688
Renin-angiotensin system	NA
Retinol metabolism	0.000
Retrograde endocannabinoid signaling	25.938
Rheumatoid arthritis	0.000
Riboflavin metabolism	0.000
Ribosome biogenesis in eukaryotes	0.000
RIG-I-like receptor signaling pathway	9002.625
RNA degradation	1944.625
RNA transport	-204.375
Salivary secretion	2967.125
Salmonella infection	-99710.393
Selenocompound metabolism	0.000
Serotonergic synapse	1417.707
Shigellosis	2303.375
Signaling pathways regulating pluripotency of stem cells	NA
Small cell lung cancer	-216736.750
SNARE interactions in vesicular transport	-1317.542
Sphingolipid metabolism	0.000
Sphingolipid signaling pathway	-54291.330
Staphylococcus aureus infection	-15724.833
Starch and sucrose metabolism	0.000
Steroid biosynthesis	0.000
Steroid hormone biosynthesis	0.000
Sulfur metabolism	0.000
Sulfur relay system	-1333.750
Synaptic vesicle cycle	0.000
Synthesis and degradation of ketone bodies	0.000
Systemic lupus erythematosus	-4275.625
T cell receptor signaling pathway	12074.958
Taste transduction	39.250
Taurine and hypotaurine metabolism	0.000
Terpenoid backbone biosynthesis	0.000
TGF-beta signaling pathway	-20660.350

Th1 and Th2 cell differentiation	243120.314
Th17 cell differentiation	7740.608
Thiamine metabolism	0.000
Thyroid cancer	20833.500
Thyroid hormone signaling pathway	-1081.476
Thyroid hormone synthesis	60.875
Tight junction	540.250
TNF signaling pathway	-37097.338
Toll-like receptor signaling pathway	-11633.651
Toxoplasmosis	-6485.625
Transcriptional misregulation in cancer	-388.000
Tryptophan metabolism	0.000
Type I diabetes mellitus	NA
Type II diabetes mellitus	2509.875
Tyrosine metabolism	0.000
Ubiquinone and other terpenoid-quinone biosynthesis	0.000
Valine, leucine and isoleucine degradation	0.000
Vascular smooth muscle contraction	-2590.558
Vasopressin-regulated water reabsorption	-2952.750
VEGF signaling pathway	1162.708
Vibrio cholerae infection	-232.317
Viral carcinogenesis	2202.625
Viral myocarditis	6853.375
Vitamin B6 metabolism	0.000
Vitamin digestion and absorption	NA
Wnt signaling pathway	15236.109

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Acute myeloid leukemia	0.24800
Adherens junction	0.15600
Adipocytokine signaling pathway	0.09400
Adrenergic signaling in cardiomyocytes	0.43200
African trypanosomiasis	0.44200
AGE-RAGE signaling pathway in diabetic complications	0.51200
Alanine, aspartate and glutamate metabolism	NA
Aldosterone synthesis and secretion	0.26800
Aldosterone-regulated sodium reabsorption	0.55200
Allograft rejection	1.00000
alpha-Linolenic acid metabolism	NA
Alzheimer's disease	0.10600
Amino sugar and nucleotide sugar metabolism	NA
Aminoacyl-tRNA biosynthesis	NA
Amoebiasis	0.91800
Amphetamine addiction	0.98600
AMPK signaling pathway	0.24400
Amyotrophic lateral sclerosis (ALS)	0.05800
Antifolate resistance	0.19400

Antigen processing and presentation	0.07200
Apelin signaling pathway	0.86400
Apoptosis	0.89000
Arachidonic acid metabolism	NA
Arginine and proline metabolism	NA
Arginine biosynthesis	NA
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.05000
Ascorbate and aldarate metabolism	NA
Asthma	NA
Autoimmune thyroid disease	NA
Autophagy - animal	0.44000
Autophagy - other	0.27800
B cell receptor signaling pathway	0.55400
Bacterial invasion of epithelial cells	0.60400
Basal cell carcinoma	0.53800
beta-Alanine metabolism	NA
Bile secretion	0.86000
Biosynthesis of unsaturated fatty acids	NA
Biotin metabolism	NA
Bladder cancer	0.47800
Breast cancer	0.20400
Butanoate metabolism	NA
Caffeine metabolism	NA
Carbohydrate digestion and absorption	0.72800
Cardiac muscle contraction	NA
Cell adhesion molecules (CAMs)	0.43400
Cell cycle	0.71000
Central carbon metabolism in cancer	0.40000
Chagas disease (American trypanosomiasis)	0.12400
Chemical carcinogenesis	NA
Choline metabolism in cancer	0.63400
Cholinergic synapse	0.66000
Chronic myeloid leukemia	0.33600
Circadian entrainment	0.28400
Circadian rhythm	0.50800
Citrate cycle (TCA cycle)	NA
Cocaine addiction	0.77400
Colorectal cancer	0.00800
Complement and coagulation cascades	0.64800
Cysteine and methionine metabolism	NA
Cytosolic DNA-sensing pathway	0.42800
D-Glutamine and D-glutamate metabolism	NA
Dilated cardiomyopathy	1.00000
Dopaminergic synapse	0.59800
Dorso-ventral axis formation	0.09600
Drug metabolism - cytochrome P450	NA

Drug metabolism - other enzymes	NA
ECM-receptor interaction	0.00800
EGFR tyrosine kinase inhibitor resistance	0.99000
Endocrine and other factor-regulated calcium reabsorption	0.06000
Endocrine resistance	0.64000
Endocytosis	NA
Endometrial cancer	0.12800
Epithelial cell signaling in Helicobacter pylori infection	0.26200
Epstein-Barr virus infection	0.35200
ErbB signaling pathway	0.46600
Estrogen signaling pathway	0.58000
Ether lipid metabolism	NA
Fanconi anemia pathway	0.36000
Fat digestion and absorption	NA
Fatty acid biosynthesis	NA
Fatty acid degradation	NA
Fatty acid elongation	NA
Fc epsilon RI signaling pathway	0.66600
Fc gamma R-mediated phagocytosis	0.59800
Ferroptosis	1.00000
Fluid shear stress and atherosclerosis	0.44600
Folate biosynthesis	NA
FoxO signaling pathway	0.67800
Fructose and mannose metabolism	NA
GABAergic synapse	0.80400
Galactose metabolism	NA
Gap junction	0.91400
Gastric acid secretion	0.26800
Glioma	0.85000
Glucagon signaling pathway	0.82600
Glutamatergic synapse	0.45000
Glutathione metabolism	NA
Glycerolipid metabolism	NA
Glycerophospholipid metabolism	NA
Glycine, serine and threonine metabolism	NA
Glycolysis / Gluconeogenesis	NA
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	NA
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	NA
Glycosaminoglycan degradation	NA
Glycosphingolipid biosynthesis - ganglio series	NA
Glycosphingolipid biosynthesis - globo and isoglobo series	NA
Glycosphingolipid biosynthesis - lacto and neolacto series	NA
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	NA
Glyoxylate and dicarboxylate metabolism	NA
GnRH signaling pathway	0.15000
Graft-versus-host disease	1.00000

Hedgehog signaling pathway	0.54600
Hepatitis B	0.29800
Hepatitis C	0.99600
Herpes simplex infection	0.16600
HIF-1 signaling pathway	0.99400
Hippo signaling pathway -multiple species	0.42000
Histidine metabolism	NA
Homologous recombination	1.00000
Huntington's disease	0.25200
Hypertrophic cardiomyopathy (HCM)	NA
IL-17 signaling pathway	0.94400
Inflammatory bowel disease (IBD)	0.83800
Inflammatory mediator regulation of TRP channels	0.68400
Influenza A	0.89400
Inositol phosphate metabolism	NA
Insulin resistance	0.02800
Insulin secretion	0.59800
Insulin signaling pathway	0.15800
Intestinal immune network for IgA production	0.54400
Legionellosis	0.41800
Leishmaniasis	0.13600
Leukocyte transendothelial migration	0.29800
Linoleic acid metabolism	NA
Lipoic acid metabolism	NA
Long-term depression	NA
Long-term potentiation	0.63600
Longevity regulating pathway	0.03600
Longevity regulating pathway - multiple species	0.46200
Lysine biosynthesis	NA
Lysine degradation	NA
Malaria	1.00000
Mannose type O-glycan biosynthesis	NA
Maturity onset diabetes of the young	0.57800
Measles	0.24400
Melanogenesis	0.63600
Melanoma	0.80600
Metabolism of xenobiotics by cytochrome P450	NA
Mineral absorption	0.12000
Mitophagy - animal	0.30600
Morphine addiction	0.97600
mRNA surveillance pathway	1.00000
mTOR signaling pathway	0.41200
Mucin type O-glycan biosynthesis	NA
N-Glycan biosynthesis	NA
Natural killer cell mediated cytotoxicity	0.56000
Neuroactive ligand-receptor interaction	0.83000

Neurotrophin signaling pathway	0.27000
NF-kappa B signaling pathway	0.17200
Nicotinate and nicotinamide metabolism	NA
Nitrogen metabolism	NA
NOD-like receptor signaling pathway	0.99600
Non-alcoholic fatty liver disease (NAFLD)	0.94000
Non-small cell lung cancer	0.49000
Notch signaling pathway	0.13800
One carbon pool by folate	NA
Oocyte meiosis	0.59800
Osteoclast differentiation	0.11600
Ovarian steroidogenesis	0.71600
Oxidative phosphorylation	NA
p53 signaling pathway	0.35400
Pancreatic cancer	0.85200
Pancreatic secretion	0.75600
Pantothenate and CoA biosynthesis	NA
Parkinson's disease	0.02600
Pathogenic Escherichia coli infection	0.00001
Pentose and glucuronate interconversions	NA
Pentose phosphate pathway	NA
Peroxisome	NA
Pertussis	0.69000
Phagosome	NA
Phenylalanine metabolism	NA
Phenylalanine, tyrosine and tryptophan biosynthesis	NA
Phosphatidylinositol signaling system	NA
Phospholipase D signaling pathway	0.32200
Phosphonate and phosphinate metabolism	NA
Phototransduction	0.28600
Platelet activation	0.84400
Platinum drug resistance	0.36200
Porphyrin and chlorophyll metabolism	NA
Primary bile acid biosynthesis	NA
Prion diseases	0.14400
Progesterone-mediated oocyte maturation	0.00001
Prolactin signaling pathway	0.50600
Propanoate metabolism	NA
Prostate cancer	0.01200
Protein processing in endoplasmic reticulum	0.31600
Proximal tubule bicarbonate reclamation	NA
Pyrimidine metabolism	NA
Pyruvate metabolism	NA
Regulation of lipolysis in adipocytes	0.32600
Renal cell carcinoma	0.51200
Renin secretion	0.33800

Renin-angiotensin system	NA
Retinol metabolism	NA
Retrograde endocannabinoid signaling	0.97200
Rheumatoid arthritis	1.00000
Riboflavin metabolism	NA
Ribosome biogenesis in eukaryotes	NA
RIG-I-like receptor signaling pathway	0.29000
RNA degradation	0.15800
RNA transport	0.84800
Salivary secretion	0.24200
Salmonella infection	0.01800
Selenocompound metabolism	NA
Serotonergic synapse	0.68000
Shigellosis	0.65800
Signaling pathways regulating pluripotency of stem cells	NA
Small cell lung cancer	0.00400
SNARE interactions in vesicular transport	0.43800
Sphingolipid metabolism	NA
Sphingolipid signaling pathway	0.10800
Staphylococcus aureus infection	0.12400
Starch and sucrose metabolism	NA
Steroid biosynthesis	NA
Steroid hormone biosynthesis	NA
Sulfur metabolism	NA
Sulfur relay system	0.25200
Synaptic vesicle cycle	NA
Synthesis and degradation of ketone bodies	NA
Systemic lupus erythematosus	0.14400
T cell receptor signaling pathway	0.38800
Taste transduction	0.76000
Taurine and hypotaurine metabolism	NA
Terpenoid backbone biosynthesis	NA
TGF-beta signaling pathway	0.16600
Th1 and Th2 cell differentiation	0.03000
Th17 cell differentiation	0.53800
Thiamine metabolism	NA
Thyroid cancer	0.02000
Thyroid hormone signaling pathway	0.90200
Thyroid hormone synthesis	0.98200
Tight junction	0.18000
TNF signaling pathway	0.06000
Toll-like receptor signaling pathway	0.50600
Toxoplasmosis	0.50200
Transcriptional misregulation in cancer	0.29000
Tryptophan metabolism	NA
Type I diabetes mellitus	NA

Type II diabetes mellitus	0.61800
Tyrosine metabolism	NA
Ubiquinone and other terpenoid-quinone biosynthesis	NA
Valine, leucine and isoleucine degradation	NA
Vascular smooth muscle contraction	0.85400
Vasopressin-regulated water reabsorption	0.34000
VEGF signaling pathway	0.90000
Vibrio cholerae infection	0.59200
Viral carcinogenesis	0.14200
Viral myocarditis	0.11400
Vitamin B6 metabolism	NA
Vitamin digestion and absorption	NA
Wnt signaling pathway	0.24000
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Acute myeloid leukemia	0.317
Adherens junction	0.017
Adipocytokine signaling pathway	0.226
Adrenergic signaling in cardiomyocytes	0.716
African trypanosomiasis	0.800
AGE-RAGE signaling pathway in diabetic complications	0.600
Alanine, aspartate and glutamate metabolism	0.584
Aldosterone synthesis and secretion	0.450
Aldosterone-regulated sodium reabsorption	0.707
Allograft rejection	0.847
alpha-Linolenic acid metabolism	0.501
Alzheimer's disease	0.067
Amino sugar and nucleotide sugar metabolism	0.064
Aminoacyl-tRNA biosynthesis	0.339
Amoebiasis	0.977
Amphetamine addiction	0.717
AMPK signaling pathway	0.026
Amyotrophic lateral sclerosis (ALS)	0.017
Antifolate resistance	0.504
Antigen processing and presentation	0.049
Apelin signaling pathway	0.985
Apoptosis	0.562
Arachidonic acid metabolism	0.486
Arginine and proline metabolism	0.745
Arginine biosynthesis	0.709
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.058
Ascorbate and aldarate metabolism	1.000
Asthma	1.000
Autoimmune thyroid disease	1.000
Autophagy - animal	0.013
Autophagy - other	0.334
B cell receptor signaling pathway	0.709

Bacterial invasion of epithelial cells	0.875
Basal cell carcinoma	0.182
beta-Alanine metabolism	0.323
Bile secretion	0.975
Biosynthesis of unsaturated fatty acids	0.394
Biotin metabolism	1.000
Bladder cancer	0.155
Breast cancer	0.189
Butanoate metabolism	0.809
Caffeine metabolism	0.750
Carbohydrate digestion and absorption	0.669
Cardiac muscle contraction	0.540
Cell adhesion molecules (CAMs)	0.776
Cell cycle	0.015
Central carbon metabolism in cancer	0.271
Chagas disease (American trypanosomiasis)	0.233
Chemical carcinogenesis	0.886
Choline metabolism in cancer	0.269
Cholinergic synapse	0.923
Chronic myeloid leukemia	0.339
Circadian entrainment	0.609
Circadian rhythm	0.711
Citrate cycle (TCA cycle)	0.075
Cocaine addiction	0.869
Colorectal cancer	0.003
Complement and coagulation cascades	0.186
Cysteine and methionine metabolism	0.419
Cytosolic DNA-sensing pathway	0.559
D-Glutamine and D-glutamate metabolism	0.473
Dilated cardiomyopathy	1.000
Dopaminergic synapse	0.863
Dorso-ventral axis formation	0.082
Drug metabolism - cytochrome P450	0.953
Drug metabolism - other enzymes	0.159
ECM-receptor interaction	0.007
EGFR tyrosine kinase inhibitor resistance	0.183
Endocrine and other factor-regulated calcium reabsorption	0.225
Endocrine resistance	0.412
Endocytosis	0.606
Endometrial cancer	0.106
Epithelial cell signaling in Helicobacter pylori infection	0.179
Epstein-Barr virus infection	0.514
ErbB signaling pathway	0.502
Estrogen signaling pathway	0.601
Ether lipid metabolism	0.728
Fanconi anemia pathway	0.069

Fat digestion and absorption	0.131
Fatty acid biosynthesis	0.706
Fatty acid degradation	0.245
Fatty acid elongation	0.843
Fc epsilon RI signaling pathway	0.639
Fc gamma R-mediated phagocytosis	0.688
Ferroptosis	0.999
Fluid shear stress and atherosclerosis	0.196
Folate biosynthesis	0.019
FoxO signaling pathway	0.294
Fructose and mannose metabolism	0.000
GABAergic synapse	0.979
Galactose metabolism	0.010
Gap junction	0.967
Gastric acid secretion	0.585
Glioma	0.669
Glucagon signaling pathway	0.959
Glutamatergic synapse	0.789
Glutathione metabolism	0.286
Glycerolipid metabolism	0.009
Glycerophospholipid metabolism	0.003
Glycine, serine and threonine metabolism	0.131
Glycolysis / Gluconeogenesis	0.220
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.016
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.610
Glycosaminoglycan degradation	0.033
Glycosphingolipid biosynthesis - ganglio series	0.259
Glycosphingolipid biosynthesis - globo and isoglobo series	0.629
Glycosphingolipid biosynthesis - lacto and neolacto series	0.978
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.330
Glyoxylate and dicarboxylate metabolism	0.100
GnRH signaling pathway	0.230
Graft-versus-host disease	0.752
Hedgehog signaling pathway	0.814
Hepatitis B	0.218
Hepatitis C	0.102
Herpes simplex infection	0.098
HIF-1 signaling pathway	0.759
Hippo signaling pathway -multiple species	0.763
Histidine metabolism	0.541
Homologous recombination	0.295
Huntington's disease	0.138
Hypertrophic cardiomyopathy (HCM)	0.763
IL-17 signaling pathway	0.993
Inflammatory bowel disease (IBD)	0.985
Inflammatory mediator regulation of TRP channels	0.845

Influenza A	0.956
Inositol phosphate metabolism	0.712
Insulin resistance	0.102
Insulin secretion	0.879
Insulin signaling pathway	0.228
Intestinal immune network for IgA production	0.845
Legionellosis	0.754
Leishmaniasis	0.322
Leukocyte transendothelial migration	0.490
Linoleic acid metabolism	0.899
Lipoic acid metabolism	0.750
Long-term depression	0.714
Long-term potentiation	0.515
Longevity regulating pathway	0.121
Longevity regulating pathway - multiple species	0.602
Lysine biosynthesis	0.603
Lysine degradation	0.784
Malaria	1.000
Mannose type O-glycan biosynthesis	0.405
Maturity onset diabetes of the young	0.731
Measles	0.524
Melanogenesis	0.743
Melanoma	0.784
Metabolism of xenobiotics by cytochrome P450	0.668
Mineral absorption	0.333
Mitophagy - animal	0.499
Morphine addiction	1.000
mRNA surveillance pathway	NaN
mTOR signaling pathway	0.038
Mucin type O-glycan biosynthesis	0.716
N-Glycan biosynthesis	0.322
Natural killer cell mediated cytotoxicity	0.572
Neuroactive ligand-receptor interaction	0.866
Neurotrophin signaling pathway	0.434
NF-kappa B signaling pathway	0.461
Nicotinate and nicotinamide metabolism	0.045
Nitrogen metabolism	0.473
NOD-like receptor signaling pathway	0.279
Non-alcoholic fatty liver disease (NAFLD)	0.609
Non-small cell lung cancer	0.545
Notch signaling pathway	0.275
One carbon pool by folate	0.184
Oocyte meiosis	0.122
Osteoclast differentiation	0.274
Ovarian steroidogenesis	0.894
Oxidative phosphorylation	0.015

p53 signaling pathway	0.499
Pancreatic cancer	0.235
Pancreatic secretion	0.950
Pantothenate and CoA biosynthesis	0.385
Parkinson's disease	0.111
Pathogenic Escherichia coli infection	0.000
Pentose and glucuronate interconversions	0.709
Pentose phosphate pathway	0.009
Peroxisome	0.131
Pertussis	0.722
Phagosome	0.982
Phenylalanine metabolism	0.259
Phenylalanine, tyrosine and tryptophan biosynthesis	0.750
Phosphatidylinositol signaling system	0.709
Phospholipase D signaling pathway	0.552
Phosphonate and phosphinate metabolism	0.717
Phototransduction	0.626
Platelet activation	0.934
Platinum drug resistance	0.449
Porphyrin and chlorophyll metabolism	0.928
Primary bile acid biosynthesis	0.638
Prion diseases	0.251
Progesterone-mediated oocyte maturation	0.000
Prolactin signaling pathway	0.440
Propanoate metabolism	0.584
Prostate cancer	0.002
Protein processing in endoplasmic reticulum	0.301
Proximal tubule bicarbonate reclamation	0.514
Pyrimidine metabolism	0.499
Pyruvate metabolism	0.224
Regulation of lipolysis in adipocytes	0.655
Renal cell carcinoma	0.096
Renin secretion	0.612
Renin-angiotensin system	1.000
Retinol metabolism	0.835
Retrograde endocannabinoid signaling	0.959
Rheumatoid arthritis	1.000
Riboflavin metabolism	0.394
Ribosome biogenesis in eukaryotes	0.750
RIG-I-like receptor signaling pathway	0.022
RNA degradation	0.247
RNA transport	0.149
Salivary secretion	0.559
Salmonella infection	0.079
Selenocompound metabolism	0.638
Serotonergic synapse	0.940

Shigellosis	0.903
Signaling pathways regulating pluripotency of stem cells	0.284
Small cell lung cancer	0.003
SNARE interactions in vesicular transport	0.653
Sphingolipid metabolism	0.157
Sphingolipid signaling pathway	0.188
Staphylococcus aureus infection	0.195
Starch and sucrose metabolism	0.194
Steroid biosynthesis	0.914
Steroid hormone biosynthesis	0.864
Sulfur metabolism	0.902
Sulfur relay system	0.548
Synaptic vesicle cycle	0.085
Synthesis and degradation of ketone bodies	0.708
Systemic lupus erythematosus	0.355
T cell receptor signaling pathway	0.430
Taste transduction	0.963
Taurine and hypotaurine metabolism	0.619
Terpenoid backbone biosynthesis	0.541
TGF-beta signaling pathway	0.162
Th1 and Th2 cell differentiation	0.127
Th17 cell differentiation	0.845
Thiamine metabolism	0.101
Thyroid cancer	0.017
Thyroid hormone signaling pathway	0.759
Thyroid hormone synthesis	0.983
Tight junction	0.295
TNF signaling pathway	0.114
Toll-like receptor signaling pathway	0.773
Toxoplasmosis	0.694
Transcriptional misregulation in cancer	0.577
Tryptophan metabolism	0.470
Type I diabetes mellitus	1.000
Type II diabetes mellitus	0.814
Tyrosine metabolism	0.716
Ubiquinone and other terpenoid-quinone biosynthesis	0.708
Valine, leucine and isoleucine degradation	0.635
Vascular smooth muscle contraction	0.894
Vasopressin-regulated water reabsorption	0.557
VEGF signaling pathway	0.884
Vibrio cholerae infection	0.899
Viral carcinogenesis	0.334
Viral myocarditis	0.273
Vitamin B6 metabolism	0.267
Vitamin digestion and absorption	1.000
Wnt signaling pathway	0.423

	pGFdr
Acute myeloid leukemia	0.8760297
Adherens junction	0.2465000
Adipocytokine signaling pathway	0.8402055
Adrenergic signaling in cardiomyocytes	1.0000000
African trypanosomiasis	1.0000000
AGE-RAGE signaling pathway in diabetic complications	1.0000000
Alanine, aspartate and glutamate metabolism	1.0000000
Aldosterone synthesis and secretion	1.0000000
Aldosterone-regulated sodium reabsorption	1.0000000
Allograft rejection	1.0000000
alpha-Linolenic acid metabolism	1.0000000
Alzheimer's disease	0.6210000
Amino sugar and nucleotide sugar metabolism	0.6186667
Aminoacyl-tRNA biosynthesis	0.8760297
Amoebiasis	1.0000000
Amphetamine addiction	1.0000000
AMPK signaling pathway	0.3231429
Amyotrophic lateral sclerosis (ALS)	0.2465000
Antifolate resistance	1.0000000
Antigen processing and presentation	0.5115600
Apelin signaling pathway	1.0000000
Apoptosis	1.0000000
Arachidonic acid metabolism	1.0000000
Arginine and proline metabolism	1.0000000
Arginine biosynthesis	1.0000000
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.5822308
Ascorbate and aldarate metabolism	1.0000000
Asthma	1.0000000
Autoimmune thyroid disease	1.0000000
Autophagy - animal	0.2465000
Autophagy - other	0.8760297
B cell receptor signaling pathway	1.0000000
Bacterial invasion of epithelial cells	1.0000000
Basal cell carcinoma	0.7993125
beta-Alanine metabolism	0.8760297
Bile secretion	1.0000000
Biosynthesis of unsaturated fatty acids	0.9793714
Biotin metabolism	1.0000000
Bladder cancer	0.7830000
Breast cancer	0.7993125
Butanoate metabolism	1.0000000
Caffeine metabolism	1.0000000
Carbohydrate digestion and absorption	1.0000000
Cardiac muscle contraction	1.0000000
Cell adhesion molecules (CAMs)	1.0000000

Cell cycle	0.2465000
Central carbon metabolism in cancer	0.8544643
Chagas disease (American trypanosomiasis)	0.8402055
Chemical carcinogenesis	1.0000000
Choline metabolism in cancer	0.8544643
Cholinergic synapse	1.0000000
Chronic myeloid leukemia	0.8760297
Circadian entrainment	1.0000000
Circadian rhythm	1.0000000
Citrate cycle (TCA cycle)	0.6525000
Cocaine addiction	1.0000000
Colorectal cancer	0.1118571
Complement and coagulation cascades	0.7993125
Cysteine and methionine metabolism	1.0000000
Cytosolic DNA-sensing pathway	1.0000000
D-Glutamine and D-glutamate metabolism	1.0000000
Dilated cardiomyopathy	1.0000000
Dopaminergic synapse	1.0000000
Dorso-ventral axis formation	0.6688125
Drug metabolism - cytochrome P450	1.0000000
Drug metabolism - other enzymes	0.7830000
ECM-receptor interaction	0.2283750
EGFR tyrosine kinase inhibitor resistance	0.7993125
Endocrine and other factor-regulated calcium reabsorption	0.8402055
Endocrine resistance	1.0000000
Endocytosis	1.0000000
Endometrial cancer	0.6916500
Epithelial cell signaling in Helicobacter pylori infection	0.7993125
Epstein-Barr virus infection	1.0000000
ErbB signaling pathway	1.0000000
Estrogen signaling pathway	1.0000000
Ether lipid metabolism	1.0000000
Fanconi anemia pathway	0.6210000
Fat digestion and absorption	0.7123125
Fatty acid biosynthesis	1.0000000
Fatty acid degradation	0.8544643
Fatty acid elongation	1.0000000
Fc epsilon RI signaling pathway	1.0000000
Fc gamma R-mediated phagocytosis	1.0000000
Ferroptosis	1.0000000
Fluid shear stress and atherosclerosis	0.7993125
Folate biosynthesis	0.2610000
FoxO signaling pathway	0.8555000
Fructose and mannose metabolism	0.0000000
GABAergic synapse	1.0000000
Galactose metabolism	0.2372727

Gap junction	1.0000000
Gastric acid secretion	1.0000000
Glioma	1.0000000
Glucagon signaling pathway	1.0000000
Glutamatergic synapse	1.0000000
Glutathione metabolism	0.8555000
Glycerolipid metabolism	0.2349000
Glycerophospholipid metabolism	0.1118571
Glycine, serine and threonine metabolism	0.7123125
Glycolysis / Gluconeogenesis	0.8402055
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.2465000
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	1.0000000
Glycosaminoglycan degradation	0.3915000
Glycosphingolipid biosynthesis - ganglio series	0.8544643
Glycosphingolipid biosynthesis - globo and isoglobo series	1.0000000
Glycosphingolipid biosynthesis - lacto and neolacto series	1.0000000
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.8760297
Glyoxylate and dicarboxylate metabolism	0.6826154
GnRH signaling pathway	0.8402055
Graft-versus-host disease	1.0000000
Hedgehog signaling pathway	1.0000000
Hepatitis B	0.8402055
Hepatitis C	0.6826154
Herpes simplex infection	0.6826154
HIF-1 signaling pathway	1.0000000
Hippo signaling pathway -multiple species	1.0000000
Histidine metabolism	1.0000000
Homologous recombination	0.8555000
Huntington's disease	0.7350612
Hypertrophic cardiomyopathy (HCM)	1.0000000
IL-17 signaling pathway	1.0000000
Inflammatory bowel disease (IBD)	1.0000000
Inflammatory mediator regulation of TRP channels	1.0000000
Influenza A	1.0000000
Inositol phosphate metabolism	1.0000000
Insulin resistance	0.6826154
Insulin secretion	1.0000000
Insulin signaling pathway	0.8402055
Intestinal immune network for IgA production	1.0000000
Legionellosis	1.0000000
Leishmaniasis	0.8760297
Leukocyte transendothelial migration	1.0000000
Linoleic acid metabolism	1.0000000
Lipoic acid metabolism	1.0000000
Long-term depression	1.0000000
Long-term potentiation	1.0000000

Longevity regulating pathway	0.7123125
Longevity regulating pathway - multiple species	1.0000000
Lysine biosynthesis	1.0000000
Lysine degradation	1.0000000
Malaria	1.0000000
Mannose type O-glycan biosynthesis	0.9972170
Maturity onset diabetes of the young	1.0000000
Measles	1.0000000
Melanogenesis	1.0000000
Melanoma	1.0000000
Metabolism of xenobiotics by cytochrome P450	1.0000000
Mineral absorption	0.8760297
Mitophagy - animal	1.0000000
Morphine addiction	1.0000000
mRNA surveillance pathway	NaN
mTOR signaling pathway	0.4312174
Mucin type O-glycan biosynthesis	1.0000000
N-Glycan biosynthesis	0.8760297
Natural killer cell mediated cytotoxicity	1.0000000
Neuroactive ligand-receptor interaction	1.0000000
Neurotrophin signaling pathway	1.0000000
NF-kappa B signaling pathway	1.0000000
Nicotinate and nicotinamide metabolism	0.4893750
Nitrogen metabolism	1.0000000
NOD-like receptor signaling pathway	0.8555000
Non-alcoholic fatty liver disease (NAFLD)	1.0000000
Non-small cell lung cancer	1.0000000
Notch signaling pathway	0.8544643
One carbon pool by folate	0.7993125
Oocyte meiosis	0.7123125
Osteoclast differentiation	0.8544643
Ovarian steroidogenesis	1.0000000
Oxidative phosphorylation	0.2465000
p53 signaling pathway	1.0000000
Pancreatic cancer	0.8402055
Pancreatic secretion	1.0000000
Pantothenate and CoA biosynthesis	0.9755825
Parkinson's disease	0.7066098
Pathogenic Escherichia coli infection	0.0000000
Pentose and glucuronate interconversions	1.0000000
Pentose phosphate pathway	0.2349000
Peroxisome	0.7123125
Pertussis	1.0000000
Phagosome	1.0000000
Phenylalanine metabolism	0.8544643
Phenylalanine, tyrosine and tryptophan biosynthesis	1.0000000

Phosphatidylinositol signaling system	1.0000000
Phospholipase D signaling pathway	1.0000000
Phosphonate and phosphinate metabolism	1.0000000
Phototransduction	1.0000000
Platelet activation	1.0000000
Platinum drug resistance	1.0000000
Porphyrin and chlorophyll metabolism	1.0000000
Primary bile acid biosynthesis	1.0000000
Prion diseases	0.8544643
Progesterone-mediated oocyte maturation	0.0000000
Prolactin signaling pathway	1.0000000
Propanoate metabolism	1.0000000
Prostate cancer	0.1118571
Protein processing in endoplasmic reticulum	0.8633077
Proximal tubule bicarbonate reclamation	1.0000000
Pyrimidine metabolism	1.0000000
Pyruvate metabolism	0.8402055
Regulation of lipolysis in adipocytes	1.0000000
Renal cell carcinoma	0.6826154
Renin secretion	1.0000000
Renin-angiotensin system	1.0000000
Retinol metabolism	1.0000000
Retrograde endocannabinoid signaling	1.0000000
Rheumatoid arthritis	1.0000000
Riboflavin metabolism	0.9793714
Ribosome biogenesis in eukaryotes	1.0000000
RIG-I-like receptor signaling pathway	0.2871000
RNA degradation	0.8544643
RNA transport	0.7777800
Salivary secretion	1.0000000
Salmonella infection	0.6651290
Selenocompound metabolism	1.0000000
Serotonergic synapse	1.0000000
Shigellosis	1.0000000
Signaling pathways regulating pluripotency of stem cells	0.8555000
Small cell lung cancer	0.1118571
SNARE interactions in vesicular transport	1.0000000
Sphingolipid metabolism	0.7830000
Sphingolipid signaling pathway	0.7993125
Staphylococcus aureus infection	0.7993125
Starch and sucrose metabolism	0.7993125
Steroid biosynthesis	1.0000000
Steroid hormone biosynthesis	1.0000000
Sulfur metabolism	1.0000000
Sulfur relay system	1.0000000
Synaptic vesicle cycle	0.6722727

Synthesis and degradation of ketone bodies	1.0000000
Systemic lupus erythematosus	0.9083824
T cell receptor signaling pathway	1.0000000
Taste transduction	1.0000000
Taurine and hypotaurine metabolism	1.0000000
Terpenoid backbone biosynthesis	1.0000000
TGF-beta signaling pathway	0.7830000
Th1 and Th2 cell differentiation	0.7123125
Th17 cell differentiation	1.0000000
Thiamine metabolism	0.6826154
Thyroid cancer	0.2465000
Thyroid hormone signaling pathway	1.0000000
Thyroid hormone synthesis	1.0000000
Tight junction	0.8555000
TNF signaling pathway	0.7084286
Toll-like receptor signaling pathway	1.0000000
Toxoplasmosis	1.0000000
Transcriptional misregulation in cancer	1.0000000
Tryptophan metabolism	1.0000000
Type I diabetes mellitus	1.0000000
Type II diabetes mellitus	1.0000000
Tyrosine metabolism	1.0000000
Ubiquinone and other terpenoid-quinone biosynthesis	1.0000000
Valine, leucine and isoleucine degradation	1.0000000
Vascular smooth muscle contraction	1.0000000
Vasopressin-regulated water reabsorption	1.0000000
VEGF signaling pathway	1.0000000
Vibrio cholerae infection	1.0000000
Viral carcinogenesis	0.8760297
Viral myocarditis	0.8544643
Vitamin B6 metabolism	0.8544643
Vitamin digestion and absorption	1.0000000
Wnt signaling pathway	1.0000000
	pGFWER
Acute myeloid leukemia	1.000
Adherens junction	1.000
Adipocytokine signaling pathway	1.000
Adrenergic signaling in cardiomyocytes	1.000
African trypanosomiasis	1.000
AGE-RAGE signaling pathway in diabetic complications	1.000
Alanine, aspartate and glutamate metabolism	1.000
Aldosterone synthesis and secretion	1.000
Aldosterone-regulated sodium reabsorption	1.000
Allograft rejection	1.000
alpha-Linolenic acid metabolism	1.000
Alzheimer's disease	1.000

Amino sugar and nucleotide sugar metabolism	1.000
Aminoacyl-tRNA biosynthesis	1.000
Amoebiasis	1.000
Amphetamine addiction	1.000
AMPK signaling pathway	1.000
Amyotrophic lateral sclerosis (ALS)	1.000
Antifolate resistance	1.000
Antigen processing and presentation	1.000
Apelin signaling pathway	1.000
Apoptosis	1.000
Arachidonic acid metabolism	1.000
Arginine and proline metabolism	1.000
Arginine biosynthesis	1.000
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	1.000
Ascorbate and aldarate metabolism	1.000
Asthma	1.000
Autoimmune thyroid disease	1.000
Autophagy - animal	1.000
Autophagy - other	1.000
B cell receptor signaling pathway	1.000
Bacterial invasion of epithelial cells	1.000
Basal cell carcinoma	1.000
beta-Alanine metabolism	1.000
Bile secretion	1.000
Biosynthesis of unsaturated fatty acids	1.000
Biotin metabolism	1.000
Bladder cancer	1.000
Breast cancer	1.000
Butanoate metabolism	1.000
Caffeine metabolism	1.000
Carbohydrate digestion and absorption	1.000
Cardiac muscle contraction	1.000
Cell adhesion molecules (CAMs)	1.000
Cell cycle	1.000
Central carbon metabolism in cancer	1.000
Chagas disease (American trypanosomiasis)	1.000
Chemical carcinogenesis	1.000
Choline metabolism in cancer	1.000
Cholinergic synapse	1.000
Chronic myeloid leukemia	1.000
Circadian entrainment	1.000
Circadian rhythm	1.000
Citrate cycle (TCA cycle)	1.000
Cocaine addiction	1.000
Colorectal cancer	0.783
Complement and coagulation cascades	1.000

Cysteine and methionine metabolism	1.000
Cytosolic DNA-sensing pathway	1.000
D-Glutamine and D-glutamate metabolism	1.000
Dilated cardiomyopathy	1.000
Dopaminergic synapse	1.000
Dorso-ventral axis formation	1.000
Drug metabolism - cytochrome P450	1.000
Drug metabolism - other enzymes	1.000
ECM-receptor interaction	1.000
EGFR tyrosine kinase inhibitor resistance	1.000
Endocrine and other factor-regulated calcium reabsorption	1.000
Endocrine resistance	1.000
Endocytosis	1.000
Endometrial cancer	1.000
Epithelial cell signaling in Helicobacter pylori infection	1.000
Epstein-Barr virus infection	1.000
ErbB signaling pathway	1.000
Estrogen signaling pathway	1.000
Ether lipid metabolism	1.000
Fanconi anemia pathway	1.000
Fat digestion and absorption	1.000
Fatty acid biosynthesis	1.000
Fatty acid degradation	1.000
Fatty acid elongation	1.000
Fc epsilon RI signaling pathway	1.000
Fc gamma R-mediated phagocytosis	1.000
Ferroptosis	1.000
Fluid shear stress and atherosclerosis	1.000
Folate biosynthesis	1.000
FoxO signaling pathway	1.000
Fructose and mannose metabolism	0.000
GABAergic synapse	1.000
Galactose metabolism	1.000
Gap junction	1.000
Gastric acid secretion	1.000
Glioma	1.000
Glucagon signaling pathway	1.000
Glutamatergic synapse	1.000
Glutathione metabolism	1.000
Glycerolipid metabolism	1.000
Glycerophospholipid metabolism	0.783
Glycine, serine and threonine metabolism	1.000
Glycolysis / Gluconeogenesis	1.000
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	1.000
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	1.000
Glycosaminoglycan degradation	1.000

Glycosphingolipid biosynthesis - ganglio series	1.000
Glycosphingolipid biosynthesis - globo and isoglobo series	1.000
Glycosphingolipid biosynthesis - lacto and neolacto series	1.000
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	1.000
Glyoxylate and dicarboxylate metabolism	1.000
GnRH signaling pathway	1.000
Graft-versus-host disease	1.000
Hedgehog signaling pathway	1.000
Hepatitis B	1.000
Hepatitis C	1.000
Herpes simplex infection	1.000
HIF-1 signaling pathway	1.000
Hippo signaling pathway -multiple species	1.000
Histidine metabolism	1.000
Homologous recombination	1.000
Huntington's disease	1.000
Hypertrophic cardiomyopathy (HCM)	1.000
IL-17 signaling pathway	1.000
Inflammatory bowel disease (IBD)	1.000
Inflammatory mediator regulation of TRP channels	1.000
Influenza A	1.000
Inositol phosphate metabolism	1.000
Insulin resistance	1.000
Insulin secretion	1.000
Insulin signaling pathway	1.000
Intestinal immune network for IgA production	1.000
Legionellosis	1.000
Leishmaniasis	1.000
Leukocyte transendothelial migration	1.000
Linoleic acid metabolism	1.000
Lipoic acid metabolism	1.000
Long-term depression	1.000
Long-term potentiation	1.000
Longevity regulating pathway	1.000
Longevity regulating pathway - multiple species	1.000
Lysine biosynthesis	1.000
Lysine degradation	1.000
Malaria	1.000
Mannose type O-glycan biosynthesis	1.000
Maturity onset diabetes of the young	1.000
Measles	1.000
Melanogenesis	1.000
Melanoma	1.000
Metabolism of xenobiotics by cytochrome P450	1.000
Mineral absorption	1.000
Mitophagy - animal	1.000

Morphine addiction	1.000
mRNA surveillance pathway	NaN
mTOR signaling pathway	1.000
Mucin type O-glycan biosynthesis	1.000
N-Glycan biosynthesis	1.000
Natural killer cell mediated cytotoxicity	1.000
Neuroactive ligand-receptor interaction	1.000
Neurotrophin signaling pathway	1.000
NF-kappa B signaling pathway	1.000
Nicotinate and nicotinamide metabolism	1.000
Nitrogen metabolism	1.000
NOD-like receptor signaling pathway	1.000
Non-alcoholic fatty liver disease (NAFLD)	1.000
Non-small cell lung cancer	1.000
Notch signaling pathway	1.000
One carbon pool by folate	1.000
Oocyte meiosis	1.000
Osteoclast differentiation	1.000
Ovarian steroidogenesis	1.000
Oxidative phosphorylation	1.000
p53 signaling pathway	1.000
Pancreatic cancer	1.000
Pancreatic secretion	1.000
Pantothenate and CoA biosynthesis	1.000
Parkinson's disease	1.000
Pathogenic Escherichia coli infection	0.000
Pentose and glucuronate interconversions	1.000
Pentose phosphate pathway	1.000
Peroxisome	1.000
Pertussis	1.000
Phagosome	1.000
Phenylalanine metabolism	1.000
Phenylalanine, tyrosine and tryptophan biosynthesis	1.000
Phosphatidylinositol signaling system	1.000
Phospholipase D signaling pathway	1.000
Phosphonate and phosphinate metabolism	1.000
Phototransduction	1.000
Platelet activation	1.000
Platinum drug resistance	1.000
Porphyrin and chlorophyll metabolism	1.000
Primary bile acid biosynthesis	1.000
Prion diseases	1.000
Progesterone-mediated oocyte maturation	0.000
Prolactin signaling pathway	1.000
Propanoate metabolism	1.000
Prostate cancer	0.522

Protein processing in endoplasmic reticulum	1.000
Proximal tubule bicarbonate reclamation	1.000
Pyrimidine metabolism	1.000
Pyruvate metabolism	1.000
Regulation of lipolysis in adipocytes	1.000
Renal cell carcinoma	1.000
Renin secretion	1.000
Renin-angiotensin system	1.000
Retinol metabolism	1.000
Retrograde endocannabinoid signaling	1.000
Rheumatoid arthritis	1.000
Riboflavin metabolism	1.000
Ribosome biogenesis in eukaryotes	1.000
RIG-I-like receptor signaling pathway	1.000
RNA degradation	1.000
RNA transport	1.000
Salivary secretion	1.000
Salmonella infection	1.000
Selenocompound metabolism	1.000
Serotonergic synapse	1.000
Shigellosis	1.000
Signaling pathways regulating pluripotency of stem cells	1.000
Small cell lung cancer	0.783
SNARE interactions in vesicular transport	1.000
Sphingolipid metabolism	1.000
Sphingolipid signaling pathway	1.000
Staphylococcus aureus infection	1.000
Starch and sucrose metabolism	1.000
Steroid biosynthesis	1.000
Steroid hormone biosynthesis	1.000
Sulfur metabolism	1.000
Sulfur relay system	1.000
Synaptic vesicle cycle	1.000
Synthesis and degradation of ketone bodies	1.000
Systemic lupus erythematosus	1.000
T cell receptor signaling pathway	1.000
Taste transduction	1.000
Taurine and hypotaurine metabolism	1.000
Terpenoid backbone biosynthesis	1.000
TGF-beta signaling pathway	1.000
Th1 and Th2 cell differentiation	1.000
Th17 cell differentiation	1.000
Thiamine metabolism	1.000
Thyroid cancer	1.000
Thyroid hormone signaling pathway	1.000
Thyroid hormone synthesis	1.000

Tight junction	1.000
TNF signaling pathway	1.000
Toll-like receptor signaling pathway	1.000
Toxoplasmosis	1.000
Transcriptional misregulation in cancer	1.000
Tryptophan metabolism	1.000
Type I diabetes mellitus	1.000
Type II diabetes mellitus	1.000
Tyrosine metabolism	1.000
Ubiquinone and other terpenoid-quinone biosynthesis	1.000
Valine, leucine and isoleucine degradation	1.000
Vascular smooth muscle contraction	1.000
Vasopressin-regulated water reabsorption	1.000
VEGF signaling pathway	1.000
Vibrio cholerae infection	1.000
Viral carcinogenesis	1.000
Viral myocarditis	1.000
Vitamin B6 metabolism	1.000
Vitamin digestion and absorption	1.000
Wnt signaling pathway	1.000

	Status
Acute myeloid leukemia	Inhibited
Adherens junction	Inhibited
Adipocytokine signaling pathway	Inhibited
Adrenergic signaling in cardiomyocytes	Inhibited
African trypanosomiasis	Inhibited
AGE-RAGE signaling pathway in diabetic complications	Inhibited
Alanine, aspartate and glutamate metabolism	Inhibited
Aldosterone synthesis and secretion	Activated
Aldosterone-regulated sodium reabsorption	Activated
Allograft rejection	Inhibited
alpha-Linolenic acid metabolism	Inhibited
Alzheimer's disease	Inhibited
Amino sugar and nucleotide sugar metabolism	Inhibited
Aminoacyl-tRNA biosynthesis	Inhibited
Amoebiasis	Inhibited
Amphetamine addiction	Inhibited
AMPK signaling pathway	Activated
Amyotrophic lateral sclerosis (ALS)	Inhibited
Antifolate resistance	Activated
Antigen processing and presentation	Inhibited
Apelin signaling pathway	Inhibited
Apoptosis	Inhibited
Arachidonic acid metabolism	Inhibited
Arginine and proline metabolism	Inhibited
Arginine biosynthesis	Inhibited

Arrhythmogenic right ventricular cardiomyopathy (ARVC)	Activated
Ascorbate and aldarate metabolism	<NA>
Asthma	<NA>
Autoimmune thyroid disease	<NA>
Autophagy - animal	Activated
Autophagy - other	Activated
B cell receptor signaling pathway	Activated
Bacterial invasion of epithelial cells	Inhibited
Basal cell carcinoma	Inhibited
beta-Alanine metabolism	Inhibited
Bile secretion	Inhibited
Biosynthesis of unsaturated fatty acids	Inhibited
Biotin metabolism	<NA>
Bladder cancer	Inhibited
Breast cancer	Activated
Butanoate metabolism	Inhibited
Caffeine metabolism	Inhibited
Carbohydrate digestion and absorption	Activated
Cardiac muscle contraction	Inhibited
Cell adhesion molecules (CAMs)	Inhibited
Cell cycle	Activated
Central carbon metabolism in cancer	Inhibited
Chagas disease (American trypanosomiasis)	Inhibited
Chemical carcinogenesis	Inhibited
Choline metabolism in cancer	Inhibited
Cholinergic synapse	Activated
Chronic myeloid leukemia	Inhibited
Circadian entrainment	Activated
Circadian rhythm	Inhibited
Citrate cycle (TCA cycle)	Inhibited
Cocaine addiction	Inhibited
Colorectal cancer	Activated
Complement and coagulation cascades	Inhibited
Cysteine and methionine metabolism	Inhibited
Cytosolic DNA-sensing pathway	Inhibited
D-Glutamine and D-glutamate metabolism	Inhibited
Dilated cardiomyopathy	Inhibited
Dopaminergic synapse	Inhibited
Dorso-ventral axis formation	Activated
Drug metabolism - cytochrome P450	Inhibited
Drug metabolism - other enzymes	Inhibited
ECM-receptor interaction	Inhibited
EGFR tyrosine kinase inhibitor resistance	Inhibited
Endocrine and other factor-regulated calcium reabsorption	Activated
Endocrine resistance	Inhibited
Endocytosis	Inhibited

Endometrial cancer	Activated
Epithelial cell signaling in Helicobacter pylori infection	Activated
Epstein-Barr virus infection	Activated
ErbB signaling pathway	Inhibited
Estrogen signaling pathway	Inhibited
Ether lipid metabolism	Inhibited
Fanconi anemia pathway	Inhibited
Fat digestion and absorption	Inhibited
Fatty acid biosynthesis	Inhibited
Fatty acid degradation	Inhibited
Fatty acid elongation	Inhibited
Fc epsilon RI signaling pathway	Inhibited
Fc gamma R-mediated phagocytosis	Activated
Ferroptosis	Inhibited
Fluid shear stress and atherosclerosis	Inhibited
Folate biosynthesis	Inhibited
FoxO signaling pathway	Inhibited
Fructose and mannose metabolism	Inhibited
GABAergic synapse	Activated
Galactose metabolism	Inhibited
Gap junction	Activated
Gastric acid secretion	Activated
Glioma	Activated
Glucagon signaling pathway	Activated
Glutamatergic synapse	Activated
Glutathione metabolism	Inhibited
Glycerolipid metabolism	Inhibited
Glycerophospholipid metabolism	Inhibited
Glycine, serine and threonine metabolism	Inhibited
Glycolysis / Gluconeogenesis	Inhibited
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	Inhibited
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	Inhibited
Glycosaminoglycan degradation	Inhibited
Glycosphingolipid biosynthesis - ganglio series	Inhibited
Glycosphingolipid biosynthesis - globo and isoglobo series	Inhibited
Glycosphingolipid biosynthesis - lacto and neolacto series	Inhibited
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	Inhibited
Glyoxylate and dicarboxylate metabolism	Inhibited
GnRH signaling pathway	Activated
Graft-versus-host disease	Inhibited
Hedgehog signaling pathway	Inhibited
Hepatitis B	Inhibited
Hepatitis C	Activated
Herpes simplex infection	Inhibited
HIF-1 signaling pathway	Activated
Hippo signaling pathway -multiple species	Activated

Histidine metabolism	Inhibited
Homologous recombination	Inhibited
Huntington's disease	Activated
Hypertrophic cardiomyopathy (HCM)	Inhibited
IL-17 signaling pathway	Activated
Inflammatory bowel disease (IBD)	Activated
Inflammatory mediator regulation of TRP channels	Inhibited
Influenza A	Activated
Inositol phosphate metabolism	Inhibited
Insulin resistance	Activated
Insulin secretion	Inhibited
Insulin signaling pathway	Activated
Intestinal immune network for IgA production	Activated
Legionellosis	Activated
Leishmaniasis	Activated
Leukocyte transendothelial migration	Inhibited
Linoleic acid metabolism	Inhibited
Lipoic acid metabolism	Inhibited
Long-term depression	<NA>
Long-term potentiation	Inhibited
Longevity regulating pathway	Activated
Longevity regulating pathway - multiple species	Activated
Lysine biosynthesis	Inhibited
Lysine degradation	Inhibited
Malaria	Inhibited
Mannose type O-glycan biosynthesis	Inhibited
Maturity onset diabetes of the young	Activated
Measles	Activated
Melanogenesis	Inhibited
Melanoma	Activated
Metabolism of xenobiotics by cytochrome P450	Inhibited
Mineral absorption	Inhibited
Mitophagy - animal	Activated
Morphine addiction	Activated
mRNA surveillance pathway	Inhibited
mTOR signaling pathway	Activated
Mucin type O-glycan biosynthesis	Inhibited
N-Glycan biosynthesis	Inhibited
Natural killer cell mediated cytotoxicity	Activated
Neuroactive ligand-receptor interaction	Activated
Neurotrophin signaling pathway	Activated
NF-kappa B signaling pathway	Inhibited
Nicotinate and nicotinamide metabolism	Inhibited
Nitrogen metabolism	Inhibited
NOD-like receptor signaling pathway	Activated
Non-alcoholic fatty liver disease (NAFLD)	Activated

Non-small cell lung cancer	Inhibited
Notch signaling pathway	Activated
One carbon pool by folate	Inhibited
Oocyte meiosis	Activated
Osteoclast differentiation	Inhibited
Ovarian steroidogenesis	Activated
Oxidative phosphorylation	Inhibited
p53 signaling pathway	Activated
Pancreatic cancer	Inhibited
Pancreatic secretion	Inhibited
Pantothenate and CoA biosynthesis	Inhibited
Parkinson's disease	Inhibited
Pathogenic Escherichia coli infection	Activated
Pentose and glucuronate interconversions	Inhibited
Pentose phosphate pathway	Inhibited
Peroxisome	Inhibited
Pertussis	Inhibited
Phagosome	Inhibited
Phenylalanine metabolism	Inhibited
Phenylalanine, tyrosine and tryptophan biosynthesis	Inhibited
Phosphatidylinositol signaling system	Inhibited
Phospholipase D signaling pathway	Activated
Phosphonate and phosphinate metabolism	Inhibited
Phototransduction	Inhibited
Platelet activation	Activated
Platinum drug resistance	Inhibited
Porphyrin and chlorophyll metabolism	Inhibited
Primary bile acid biosynthesis	Inhibited
Prion diseases	Inhibited
Progesterone-mediated oocyte maturation	Activated
Prolactin signaling pathway	Inhibited
Propanoate metabolism	Inhibited
Prostate cancer	Activated
Protein processing in endoplasmic reticulum	Activated
Proximal tubule bicarbonate reclamation	Inhibited
Pyrimidine metabolism	Inhibited
Pyruvate metabolism	Inhibited
Regulation of lipolysis in adipocytes	Inhibited
Renal cell carcinoma	Inhibited
Renin secretion	Activated
Renin-angiotensin system	<NA>
Retinol metabolism	Inhibited
Retrograde endocannabinoid signaling	Activated
Rheumatoid arthritis	Inhibited
Riboflavin metabolism	Inhibited
Ribosome biogenesis in eukaryotes	Inhibited

RIG-I-like receptor signaling pathway	Activated
RNA degradation	Activated
RNA transport	Inhibited
Salivary secretion	Activated
Salmonella infection	Inhibited
Selenocompound metabolism	Inhibited
Serotonergic synapse	Activated
Shigellosis	Activated
Signaling pathways regulating pluripotency of stem cells	<NA>
Small cell lung cancer	Inhibited
SNARE interactions in vesicular transport	Inhibited
Sphingolipid metabolism	Inhibited
Sphingolipid signaling pathway	Inhibited
Staphylococcus aureus infection	Inhibited
Starch and sucrose metabolism	Inhibited
Steroid biosynthesis	Inhibited
Steroid hormone biosynthesis	Inhibited
Sulfur metabolism	Inhibited
Sulfur relay system	Inhibited
Synaptic vesicle cycle	Inhibited
Synthesis and degradation of ketone bodies	Inhibited
Systemic lupus erythematosus	Inhibited
T cell receptor signaling pathway	Activated
Taste transduction	Activated
Taurine and hypotaurine metabolism	Inhibited
Terpenoid backbone biosynthesis	Inhibited
TGF-beta signaling pathway	Inhibited
Th1 and Th2 cell differentiation	Activated
Th17 cell differentiation	Activated
Thiamine metabolism	Inhibited
Thyroid cancer	Activated
Thyroid hormone signaling pathway	Inhibited
Thyroid hormone synthesis	Activated
Tight junction	Activated
TNF signaling pathway	Inhibited
Toll-like receptor signaling pathway	Inhibited
Toxoplasmosis	Inhibited
Transcriptional misregulation in cancer	Inhibited
Tryptophan metabolism	Inhibited
Type I diabetes mellitus	<NA>
Type II diabetes mellitus	Activated
Tyrosine metabolism	Inhibited
Ubiquinone and other terpenoid-quinone biosynthesis	Inhibited
Valine, leucine and isoleucine degradation	Inhibited
Vascular smooth muscle contraction	Inhibited
Vasopressin-regulated water reabsorption	Inhibited

```
VEGF signaling pathway                                                Activated
Vibrio cholerae infection                                             Inhibited
Viral carcinogenesis                                                  Activated
Viral myocarditis                                                     Activated
Vitamin B6 metabolism                                                 Inhibited
Vitamin digestion and absorption                                           <NA>
Wnt signaling pathway                                                 Activated

$errors
named list()
```

Apart from the expected arguments: a gene expression data matrix, a vector of class labels and a list of pathways, the user needs to specify the `type` argument which decides on the type of the data (`"MA"` is used for expression microarray and `"RNASeq"` for RNA-Seq data). Alternatively, the user can supply the results of the differential expression analysis of genes in two forms:

1. a data.frame with columns: *ID* gene identifiers (they must match with the node labels), *logFC* log fold-changes, *t* - t-statistics, *pval* p-values, *padj* adjusted p-values. Then the user sets `type` to `DEtable`
2. a list with two slots: named vector of log fold-changes of differentially expressed genes and a vector of names of all genes analysed. Then the user sets `type` to `DElist`

The others arguments are optional. Arguments `convertTo` and `convertBy` control the conversion of the node labels in the pathways. The default setting is `convertTo="none"` which performs no conversion. Please note, that the node labels should be the same as the rownames of gene expression data matrix. The default thresholds for the differential expression analysis of genes (the moderated t-test from `limma` is used) are set with arguments `logFC.th` and `p.val.th`. The user can omit one of these criteria by setting the agrument negative value, as is shown also in the example. The implementation returns also a gene-level statistics of the differential expression of genes. These statistics are later used in the visualization of a selected pathway.

3.5 TAPPA

TAPPA was among the first topology-based pathway analysis methods. It was inspired in chemointformatics and their models for predicting the structure of molecules. In TAPPA, the gene expression values are standardized and sigma-transformed within a samples. Then, a pathway is seen a molecule, individual genes as atoms and the energy of a molecule is a score defined for one sample. This score is called Pathway Connectivity Index. The difference of expression is assessed via a common univariable two sample test - Mann-Whitney in our implemetation.

```
> tap<-TAPPA(hnrnp.cnts, group, pathways, type="RNASeq")

15481 node labels mapped to the expression data
Average coverage 85.24048 %
0 (out of 285) pathways without a mapped node

> res(tap)

$results
                                                                 control.N
Acute myeloid leukemia                                                   4
Adherens junction                                                        4
Adipocytokine signaling pathway                                          4
Adrenergic signaling in cardiomyocytes                                   4
African trypanosomiasis                                                  4
AGE-RAGE signaling pathway in diabetic complications                     4
Alanine, aspartate and glutamate metabolism                              4
Aldosterone synthesis and secretion                                      4
Aldosterone-regulated sodium reabsorption                                4
Allograft rejection                                                      4
alpha-Linolenic acid metabolism                                          4
Alzheimer's disease                                                      4
Amino sugar and nucleotide sugar metabolism                              4
Aminoacyl-tRNA biosynthesis                                              4
Amoebiasis                                                               4
Amphetamine addiction                                                    4
AMPK signaling pathway                                                   4
Amyotrophic lateral sclerosis (ALS)                                      4
Antifolate resistance                                                    4
Antigen processing and presentation                                      4
Apelin signaling pathway                                                 4
Apoptosis                                                                4
Arachidonic acid metabolism                                              4
Arginine and proline metabolism                                          4
Arginine biosynthesis                                                    4
Arrhythmogenic right ventricular cardiomyopathy (ARVC)                   4
Ascorbate and aldarate metabolism                                        4
Asthma                                                                   4
Autoimmune thyroid disease                                               4
Autophagy - animal                                                       4
Autophagy - other                                                        4
B cell receptor signaling pathway                                        4
Bacterial invasion of epithelial cells                                   4
Basal cell carcinoma                                                     4
beta-Alanine metabolism                                                  4
Bile secretion                                                           4
Biosynthesis of unsaturated fatty acids                                  4
```

Biotin metabolism	4
Bladder cancer	4
Breast cancer	4
Butanoate metabolism	4
Caffeine metabolism	4
Carbohydrate digestion and absorption	4
Cardiac muscle contraction	4
Cell adhesion molecules (CAMs)	4
Cell cycle	4
Central carbon metabolism in cancer	4
Chagas disease (American trypanosomiasis)	4
Chemical carcinogenesis	4
Choline metabolism in cancer	4
Cholinergic synapse	4
Chronic myeloid leukemia	4
Circadian entrainment	4
Circadian rhythm	4
Citrate cycle (TCA cycle)	4
Cocaine addiction	4
Colorectal cancer	4
Complement and coagulation cascades	4
Cysteine and methionine metabolism	4
Cytosolic DNA-sensing pathway	4
D-Glutamine and D-glutamate metabolism	4
Dilated cardiomyopathy	4
Dopaminergic synapse	4
Dorso-ventral axis formation	4
Drug metabolism - cytochrome P450	4
Drug metabolism - other enzymes	4
ECM-receptor interaction	4
EGFR tyrosine kinase inhibitor resistance	4
Endocrine and other factor-regulated calcium reabsorption	4
Endocrine resistance	4
Endocytosis	4
Endometrial cancer	4
Epithelial cell signaling in Helicobacter pylori infection	4
Epstein-Barr virus infection	4
ErbB signaling pathway	4
Estrogen signaling pathway	4
Ether lipid metabolism	4
Fanconi anemia pathway	4
Fat digestion and absorption	4
Fatty acid biosynthesis	4
Fatty acid degradation	4
Fatty acid elongation	4
Fc epsilon RI signaling pathway	4

Fc gamma R-mediated phagocytosis	4
Ferroptosis	4
Fluid shear stress and atherosclerosis	4
Folate biosynthesis	4
FoxO signaling pathway	4
Fructose and mannose metabolism	4
GABAergic synapse	4
Galactose metabolism	4
Gap junction	4
Gastric acid secretion	4
Glioma	4
Glucagon signaling pathway	4
Glutamatergic synapse	4
Glutathione metabolism	4
Glycerolipid metabolism	4
Glycerophospholipid metabolism	4
Glycine, serine and threonine metabolism	4
Glycolysis / Gluconeogenesis	4
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	4
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	4
Glycosaminoglycan degradation	4
Glycosphingolipid biosynthesis - ganglio series	4
Glycosphingolipid biosynthesis - globo and isoglobo series	4
Glycosphingolipid biosynthesis - lacto and neolacto series	4
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	4
Glyoxylate and dicarboxylate metabolism	4
GnRH signaling pathway	4
Graft-versus-host disease	4
Hedgehog signaling pathway	4
Hepatitis B	4
Hepatitis C	4
Herpes simplex infection	4
HIF-1 signaling pathway	4
Hippo signaling pathway -multiple species	4
Histidine metabolism	4
Homologous recombination	4
Huntington's disease	4
Hypertrophic cardiomyopathy (HCM)	4
IL-17 signaling pathway	4
Inflammatory bowel disease (IBD)	4
Inflammatory mediator regulation of TRP channels	4
Influenza A	4
Inositol phosphate metabolism	4
Insulin resistance	4
Insulin secretion	4
Insulin signaling pathway	4

Intestinal immune network for IgA production	4
Legionellosis	4
Leishmaniasis	4
Leukocyte transendothelial migration	4
Linoleic acid metabolism	4
Lipoic acid metabolism	4
Long-term depression	4
Long-term potentiation	4
Longevity regulating pathway	4
Longevity regulating pathway - multiple species	4
Lysine biosynthesis	4
Lysine degradation	4
Malaria	4
Mannose type O-glycan biosynthesis	4
Maturity onset diabetes of the young	4
Measles	4
Melanogenesis	4
Melanoma	4
Metabolism of xenobiotics by cytochrome P450	4
Mineral absorption	4
Mitophagy - animal	4
Morphine addiction	4
mRNA surveillance pathway	4
mTOR signaling pathway	4
Mucin type O-glycan biosynthesis	4
N-Glycan biosynthesis	4
Natural killer cell mediated cytotoxicity	4
Neuroactive ligand-receptor interaction	4
Neurotrophin signaling pathway	4
NF-kappa B signaling pathway	4
Nicotinate and nicotinamide metabolism	4
Nitrogen metabolism	4
NOD-like receptor signaling pathway	4
Non-alcoholic fatty liver disease (NAFLD)	4
Non-small cell lung cancer	4
Notch signaling pathway	4
One carbon pool by folate	4
Oocyte meiosis	4
Osteoclast differentiation	4
Ovarian steroidogenesis	4
Oxidative phosphorylation	4
p53 signaling pathway	4
Pancreatic cancer	4
Pancreatic secretion	4
Pantothenate and CoA biosynthesis	4
Parkinson's disease	4

Pathogenic Escherichia coli infection	4
Pentose and glucuronate interconversions	4
Pentose phosphate pathway	4
Peroxisome	4
Pertussis	4
Phagosome	4
Phenylalanine metabolism	4
Phenylalanine, tyrosine and tryptophan biosynthesis	4
Phosphatidylinositol signaling system	4
Phospholipase D signaling pathway	4
Phosphonate and phosphinate metabolism	4
Phototransduction	4
Platelet activation	4
Platinum drug resistance	4
Porphyrin and chlorophyll metabolism	4
Primary bile acid biosynthesis	4
Prion diseases	4
Progesterone-mediated oocyte maturation	4
Prolactin signaling pathway	4
Propanoate metabolism	4
Prostate cancer	4
Protein processing in endoplasmic reticulum	4
Proximal tubule bicarbonate reclamation	4
Pyrimidine metabolism	4
Pyruvate metabolism	4
Regulation of lipolysis in adipocytes	4
Renal cell carcinoma	4
Renin secretion	4
Renin-angiotensin system	4
Retinol metabolism	4
Retrograde endocannabinoid signaling	4
Rheumatoid arthritis	4
Riboflavin metabolism	4
Ribosome biogenesis in eukaryotes	4
RIG-I-like receptor signaling pathway	4
RNA degradation	4
RNA transport	4
Salivary secretion	4
Salmonella infection	4
Selenocompound metabolism	4
Serotonergic synapse	4
Shigellosis	4
Signaling pathways regulating pluripotency of stem cells	4
Small cell lung cancer	4
SNARE interactions in vesicular transport	4
Sphingolipid metabolism	4

Sphingolipid signaling pathway	4
Staphylococcus aureus infection	4
Starch and sucrose metabolism	4
Steroid biosynthesis	4
Steroid hormone biosynthesis	4
Sulfur metabolism	4
Sulfur relay system	4
Synaptic vesicle cycle	4
Synthesis and degradation of ketone bodies	4
Systemic lupus erythematosus	4
T cell receptor signaling pathway	4
Taste transduction	4
Taurine and hypotaurine metabolism	4
Terpenoid backbone biosynthesis	4
TGF-beta signaling pathway	4
Th1 and Th2 cell differentiation	4
Th17 cell differentiation	4
Thiamine metabolism	4
Thyroid cancer	4
Thyroid hormone signaling pathway	4
Thyroid hormone synthesis	4
Tight junction	4
TNF signaling pathway	4
Toll-like receptor signaling pathway	4
Toxoplasmosis	4
Transcriptional misregulation in cancer	4
Tryptophan metabolism	4
Type I diabetes mellitus	4
Type II diabetes mellitus	4
Tyrosine metabolism	4
Ubiquinone and other terpenoid-quinone biosynthesis	4
Valine, leucine and isoleucine degradation	4
Vascular smooth muscle contraction	4
Vasopressin-regulated water reabsorption	4
VEGF signaling pathway	4
Vibrio cholerae infection	4
Viral carcinogenesis	4
Viral myocarditis	4
Vitamin B6 metabolism	4
Vitamin digestion and absorption	4
Wnt signaling pathway	4
	control.Min.
Acute myeloid leukemia	0.43010262
Adherens junction	0.55429341
Adipocytokine signaling pathway	0.21331371
Adrenergic signaling in cardiomyocytes	-0.36397758

African trypanosomiasis	-0.25056440
AGE-RAGE signaling pathway in diabetic complications	0.21523637
Alanine, aspartate and glutamate metabolism	0.53226061
Aldosterone synthesis and secretion	0.01342282
Aldosterone-regulated sodium reabsorption	0.14743521
Allograft rejection	-0.17706727
alpha-Linolenic acid metabolism	0.02626842
Alzheimer's disease	0.26835746
Amino sugar and nucleotide sugar metabolism	0.45876447
Aminoacyl-tRNA biosynthesis	0.26360267
Amoebiasis	-0.11825088
Amphetamine addiction	-0.14799825
AMPK signaling pathway	0.46434994
Amyotrophic lateral sclerosis (ALS)	0.17199841
Antifolate resistance	0.03579443
Antigen processing and presentation	-0.09176251
Apelin signaling pathway	0.25883623
Apoptosis	0.32619837
Arachidonic acid metabolism	-0.78793028
Arginine and proline metabolism	-0.01675838
Arginine biosynthesis	0.26201034
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.33121249
Ascorbate and aldarate metabolism	-0.63219431
Asthma	-0.44753507
Autoimmune thyroid disease	-0.42881141
Autophagy - animal	0.50393880
Autophagy - other	0.61442038
B cell receptor signaling pathway	0.10910558
Bacterial invasion of epithelial cells	0.44079128
Basal cell carcinoma	0.14111574
beta-Alanine metabolism	-0.29468886
Bile secretion	-0.05664233
Biosynthesis of unsaturated fatty acids	0.16109515
Biotin metabolism	0.26104571
Bladder cancer	0.45504588
Breast cancer	0.37914170
Butanoate metabolism	0.13676790
Caffeine metabolism	-0.50050187
Carbohydrate digestion and absorption	0.11981288
Cardiac muscle contraction	-0.19478022
Cell adhesion molecules (CAMs)	-0.22443532
Cell cycle	0.80782681
Central carbon metabolism in cancer	0.53767625
Chagas disease (American trypanosomiasis)	0.28443213
Chemical carcinogenesis	-0.92819270
Choline metabolism in cancer	0.33168518

Cholinergic synapse	0.06774559
Chronic myeloid leukemia	0.56812220
Circadian entrainment	-0.12683522
Circadian rhythm	0.44840931
Citrate cycle (TCA cycle)	0.91840182
Cocaine addiction	-0.02874870
Colorectal cancer	0.38700418
Complement and coagulation cascades	-0.21293620
Cysteine and methionine metabolism	0.48580196
Cytosolic DNA-sensing pathway	0.23201834
D-Glutamine and D-glutamate metabolism	0.31335731
Dilated cardiomyopathy	0.21597360
Dopaminergic synapse	-0.04669881
Dorso-ventral axis formation	0.26258770
Drug metabolism - cytochrome P450	-0.51496475
Drug metabolism - other enzymes	0.04653893
ECM-receptor interaction	0.39288283
EGFR tyrosine kinase inhibitor resistance	0.49764079
Endocrine and other factor-regulated calcium reabsorption	-0.14697411
Endocrine resistance	0.46572805
Endocytosis	0.65687311
Endometrial cancer	0.48936180
Epithelial cell signaling in Helicobacter pylori infection	0.13033546
Epstein-Barr virus infection	0.33775788
ErbB signaling pathway	0.35486415
Estrogen signaling pathway	0.18798733
Ether lipid metabolism	0.03850324
Fanconi anemia pathway	0.51621397
Fat digestion and absorption	0.35052455
Fatty acid biosynthesis	0.34810512
Fatty acid degradation	0.54194340
Fatty acid elongation	0.25661854
Fc epsilon RI signaling pathway	0.23398228
Fc gamma R-mediated phagocytosis	0.33750857
Ferroptosis	0.27664790
Fluid shear stress and atherosclerosis	0.32539565
Folate biosynthesis	0.27368105
FoxO signaling pathway	0.30951757
Fructose and mannose metabolism	0.35067209
GABAergic synapse	-0.46697347
Galactose metabolism	0.40999290
Gap junction	0.07133104
Gastric acid secretion	0.09198309
Glioma	0.41587649
Glucagon signaling pathway	0.37038686
Glutamatergic synapse	-0.18609627

Glutathione metabolism	0.24969680
Glycerolipid metabolism	0.68556137
Glycerophospholipid metabolism	0.70651967
Glycine, serine and threonine metabolism	-0.02546674
Glycolysis / Gluconeogenesis	0.50390270
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.42871805
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.40154219
Glycosaminoglycan degradation	0.37373862
Glycosphingolipid biosynthesis - ganglio series	0.24677963
Glycosphingolipid biosynthesis - globo and isoglobo series	-0.09519205
Glycosphingolipid biosynthesis - lacto and neolacto series	-0.49891161
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.41307169
Glyoxylate and dicarboxylate metabolism	0.26271685
GnRH signaling pathway	0.22084791
Graft-versus-host disease	-0.30008855
Hedgehog signaling pathway	0.20773249
Hepatitis B	0.29449493
Hepatitis C	0.40530523
Herpes simplex infection	0.29445797
HIF-1 signaling pathway	0.51496690
Hippo signaling pathway -multiple species	0.32801452
Histidine metabolism	-0.33175715
Homologous recombination	0.18628813
Huntington's disease	0.76241741
Hypertrophic cardiomyopathy (HCM)	0.23643686
IL-17 signaling pathway	0.20797968
Inflammatory bowel disease (IBD)	-0.19633203
Inflammatory mediator regulation of TRP channels	0.09723526
Influenza A	0.25716793
Inositol phosphate metabolism	0.99850514
Insulin resistance	0.36719000
Insulin secretion	-0.16123818
Insulin signaling pathway	0.46926221
Intestinal immune network for IgA production	-0.19977451
Legionellosis	-0.10141105
Leishmaniasis	-0.04871718
Leukocyte transendothelial migration	0.10149385
Linoleic acid metabolism	-1.32921557
Lipoic acid metabolism	-0.19869341
Long-term depression	0.15910568
Long-term potentiation	0.09904738
Longevity regulating pathway	0.59324378
Longevity regulating pathway - multiple species	0.56579322
Lysine biosynthesis	-0.15296119
Lysine degradation	0.61029413
Malaria	-0.26520083

Mannose type O-glycan biosynthesis	0.29782817
Maturity onset diabetes of the young	-0.18112679
Measles	0.16991458
Melanogenesis	0.11735994
Melanoma	0.16835348
Metabolism of xenobiotics by cytochrome P450	-1.17076891
Mineral absorption	-0.03678144
Mitophagy - animal	0.32010698
Morphine addiction	-0.34304599
mRNA surveillance pathway	0.56855807
mTOR signaling pathway	0.47684026
Mucin type O-glycan biosynthesis	-0.41132936
N-Glycan biosynthesis	0.61801849
Natural killer cell mediated cytotoxicity	0.05655042
Neuroactive ligand-receptor interaction	-0.43350702
Neurotrophin signaling pathway	0.31841959
NF-kappa B signaling pathway	0.15787959
Nicotinate and nicotinamide metabolism	-0.19142201
Nitrogen metabolism	0.58701143
NOD-like receptor signaling pathway	0.10424215
Non-alcoholic fatty liver disease (NAFLD)	0.20712963
Non-small cell lung cancer	0.46588950
Notch signaling pathway	0.39263343
One carbon pool by folate	0.71228386
Oocyte meiosis	0.54258544
Osteoclast differentiation	0.10773809
Ovarian steroidogenesis	-0.03102056
Oxidative phosphorylation	0.47496266
p53 signaling pathway	0.29227636
Pancreatic cancer	0.45482491
Pancreatic secretion	0.04473820
Pantothenate and CoA biosynthesis	0.11631525
Parkinson's disease	0.12098103
Pathogenic Escherichia coli infection	0.25096699
Pentose and glucuronate interconversions	-0.30620910
Pentose phosphate pathway	0.13536067
Peroxisome	0.13184649
Pertussis	0.08010053
Phagosome	1.04707587
Phenylalanine metabolism	-0.13950656
Phenylalanine, tyrosine and tryptophan biosynthesis	0.30815915
Phosphatidylinositol signaling system	1.24457438
Phospholipase D signaling pathway	0.33961879
Phosphonate and phosphinate metabolism	0.12666597
Phototransduction	-0.49596789
Platelet activation	0.22267837

Platinum drug resistance	0.39076500
Porphyrin and chlorophyll metabolism	-0.01173483
Primary bile acid biosynthesis	-0.29406448
Prion diseases	0.31547323
Progesterone-mediated oocyte maturation	0.20722403
Prolactin signaling pathway	0.31730911
Propanoate metabolism	0.31391781
Prostate cancer	0.46960553
Protein processing in endoplasmic reticulum	0.38014934
Proximal tubule bicarbonate reclamation	0.16238224
Pyrimidine metabolism	1.04253922
Pyruvate metabolism	0.47051980
Regulation of lipolysis in adipocytes	0.17754949
Renal cell carcinoma	0.42275110
Renin secretion	0.18806162
Renin-angiotensin system	-0.13254869
Retinol metabolism	-1.76023700
Retrograde endocannabinoid signaling	0.07276248
Rheumatoid arthritis	-0.20129079
Riboflavin metabolism	0.27276343
Ribosome biogenesis in eukaryotes	0.29943996
RIG-I-like receptor signaling pathway	0.25990108
RNA degradation	0.68447194
RNA transport	0.37971217
Salivary secretion	0.01468055
Salmonella infection	0.37528791
Selenocompound metabolism	0.35341182
Serotonergic synapse	-0.19471884
Shigellosis	0.32495648
Signaling pathways regulating pluripotency of stem cells	0.35465321
Small cell lung cancer	0.59256392
SNARE interactions in vesicular transport	0.40264498
Sphingolipid metabolism	0.67400287
Sphingolipid signaling pathway	0.41636759
Staphylococcus aureus infection	-0.15656126
Starch and sucrose metabolism	0.38517748
Steroid biosynthesis	0.37482793
Steroid hormone biosynthesis	-1.08800521
Sulfur metabolism	0.50162745
Sulfur relay system	0.28279258
Synaptic vesicle cycle	0.58436974
Synthesis and degradation of ketone bodies	0.10345238
Systemic lupus erythematosus	-0.29479017
T cell receptor signaling pathway	0.18990144
Taste transduction	-0.36875968
Taurine and hypotaurine metabolism	-0.28520172

Terpenoid backbone biosynthesis	0.35261101
TGF-beta signaling pathway	0.21449845
Th1 and Th2 cell differentiation	-0.09497693
Th17 cell differentiation	0.10895092
Thiamine metabolism	0.15739770
Thyroid cancer	0.34549256
Thyroid hormone signaling pathway	0.59812633
Thyroid hormone synthesis	-0.08284055
Tight junction	-0.02546930
TNF signaling pathway	0.28451730
Toll-like receptor signaling pathway	0.07903465
Toxoplasmosis	0.24734090
Transcriptional misregulation in cancer	0.08348301
Tryptophan metabolism	-0.29258897
Type I diabetes mellitus	-0.43104730
Type II diabetes mellitus	0.16628392
Tyrosine metabolism	-0.40807562
Ubiquinone and other terpenoid-quinone biosynthesis	0.28195998
Valine, leucine and isoleucine degradation	0.50678536
Vascular smooth muscle contraction	0.16804900
Vasopressin-regulated water reabsorption	-0.02111966
VEGF signaling pathway	0.29659484
Vibrio cholerae infection	0.39994339
Viral carcinogenesis	0.32473685
Viral myocarditis	0.11220656
Vitamin B6 metabolism	0.11834518
Vitamin digestion and absorption	-0.51073469
Wnt signaling pathway	0.17929453

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Acute myeloid leukemia	0.436606429
Adherens junction	0.557427325
Adipocytokine signaling pathway	0.227236094
Adrenergic signaling in cardiomyocytes	-0.348920419
African trypanosomiasis	-0.237568522
AGE-RAGE signaling pathway in diabetic complications	0.249309195
Alanine, aspartate and glutamate metabolism	0.537804104
Aldosterone synthesis and secretion	0.046336555
Aldosterone-regulated sodium reabsorption	0.152340843
Allograft rejection	-0.172606049
alpha-Linolenic acid metabolism	0.054383638
Alzheimer's disease	0.292829503
Amino sugar and nucleotide sugar metabolism	0.465706924
Aminoacyl-tRNA biosynthesis	0.264573328
Amoebiasis	-0.108455862
Amphetamine addiction	-0.139653021
AMPK signaling pathway	0.466388458

Amyotrophic lateral sclerosis (ALS)	0.174339195
Antifolate resistance	0.039260868
Antigen processing and presentation	-0.071846550
Apelin signaling pathway	0.260483646
Apoptosis	0.330853898
Arachidonic acid metabolism	-0.767582320
Arginine and proline metabolism	-0.015644646
Arginine biosynthesis	0.264092171
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.331656553
Ascorbate and aldarate metabolism	-0.607972308
Asthma	-0.434878221
Autoimmune thyroid disease	-0.420045167
Autophagy - animal	0.505218903
Autophagy - other	0.621270040
B cell receptor signaling pathway	0.120085328
Bacterial invasion of epithelial cells	0.452050538
Basal cell carcinoma	0.162882106
beta-Alanine metabolism	-0.224638567
Bile secretion	-0.043034806
Biosynthesis of unsaturated fatty acids	0.163736472
Biotin metabolism	0.262219641
Bladder cancer	0.457787350
Breast cancer	0.385984127
Butanoate metabolism	0.186504236
Caffeine metabolism	-0.460868856
Carbohydrate digestion and absorption	0.132504963
Cardiac muscle contraction	-0.194622964
Cell adhesion molecules (CAMs)	-0.221780665
Cell cycle	0.810801803
Central carbon metabolism in cancer	0.546553821
Chagas disease (American trypanosomiasis)	0.295157564
Chemical carcinogenesis	-0.888460117
Choline metabolism in cancer	0.332654458
Cholinergic synapse	0.088249325
Chronic myeloid leukemia	0.568898059
Circadian entrainment	-0.067600184
Circadian rhythm	0.451079405
Citrate cycle (TCA cycle)	0.919375588
Cocaine addiction	0.001474659
Colorectal cancer	0.394003876
Complement and coagulation cascades	-0.210903822
Cysteine and methionine metabolism	0.492474918
Cytosolic DNA-sensing pathway	0.232919828
D-Glutamine and D-glutamate metabolism	0.313679797
Dilated cardiomyopathy	0.216666682
Dopaminergic synapse	-0.003451453

Dorso-ventral axis formation	0.264762584
Drug metabolism - cytochrome P450	-0.507526813
Drug metabolism - other enzymes	0.082446142
ECM-receptor interaction	0.416333637
EGFR tyrosine kinase inhibitor resistance	0.507083263
Endocrine and other factor-regulated calcium reabsorption	-0.134276758
Endocrine resistance	0.466682372
Endocytosis	0.673143836
Endometrial cancer	0.495541393
Epithelial cell signaling in Helicobacter pylori infection	0.136510089
Epstein-Barr virus infection	0.349671615
ErbB signaling pathway	0.357537606
Estrogen signaling pathway	0.205286650
Ether lipid metabolism	0.044529652
Fanconi anemia pathway	0.539391981
Fat digestion and absorption	0.358405914
Fatty acid biosynthesis	0.348942564
Fatty acid degradation	0.614469193
Fatty acid elongation	0.260613555
Fc epsilon RI signaling pathway	0.234066209
Fc gamma R-mediated phagocytosis	0.365421637
Ferroptosis	0.277642510
Fluid shear stress and atherosclerosis	0.342780910
Folate biosynthesis	0.274532576
FoxO signaling pathway	0.309759969
Fructose and mannose metabolism	0.442482816
GABAergic synapse	-0.461817627
Galactose metabolism	0.418111001
Gap junction	0.098386389
Gastric acid secretion	0.132265082
Glioma	0.430630985
Glucagon signaling pathway	0.382329090
Glutamatergic synapse	-0.173745729
Glutathione metabolism	0.256310632
Glycerolipid metabolism	0.714279047
Glycerophospholipid metabolism	0.741573251
Glycine, serine and threonine metabolism	-0.021360754
Glycolysis / Gluconeogenesis	0.512749116
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.429206865
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.401792099
Glycosaminoglycan degradation	0.378451489
Glycosphingolipid biosynthesis - ganglio series	0.251625813
Glycosphingolipid biosynthesis - globo and isoglobo series	-0.092802788
Glycosphingolipid biosynthesis - lacto and neolacto series	-0.481756208
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.424665329
Glyoxylate and dicarboxylate metabolism	0.264298051

GnRH signaling pathway	0.233665842
Graft-versus-host disease	-0.296445947
Hedgehog signaling pathway	0.216766802
Hepatitis B	0.298731586
Hepatitis C	0.407597589
Herpes simplex infection	0.298746598
HIF-1 signaling pathway	0.530325431
Hippo signaling pathway -multiple species	0.330323246
Histidine metabolism	-0.331267342
Homologous recombination	0.191881148
Huntington's disease	0.779708092
Hypertrophic cardiomyopathy (HCM)	0.237840115
IL-17 signaling pathway	0.210463862
Inflammatory bowel disease (IBD)	-0.192751940
Inflammatory mediator regulation of TRP channels	0.111035451
Influenza A	0.276425042
Inositol phosphate metabolism	1.005658964
Insulin resistance	0.385098826
Insulin secretion	-0.138572553
Insulin signaling pathway	0.469283380
Intestinal immune network for IgA production	-0.196149075
Legionellosis	-0.099266165
Leishmaniasis	-0.044136926
Leukocyte transendothelial migration	0.111891610
Linoleic acid metabolism	-1.324543049
Lipoic acid metabolism	-0.180071032
Long-term depression	0.193387583
Long-term potentiation	0.145890948
Longevity regulating pathway	0.601707854
Longevity regulating pathway - multiple species	0.571856148
Lysine biosynthesis	-0.137137071
Lysine degradation	0.610352295
Malaria	-0.257618802
Mannose type O-glycan biosynthesis	0.335954598
Maturity onset diabetes of the young	-0.169974389
Measles	0.178364706
Melanogenesis	0.160044134
Melanoma	0.253770200
Metabolism of xenobiotics by cytochrome P450	-1.153657938
Mineral absorption	-0.029656053
Mitophagy - animal	0.322040306
Morphine addiction	-0.311930458
mRNA surveillance pathway	0.572039703
mTOR signaling pathway	0.495641970
Mucin type O-glycan biosynthesis	-0.409832510
N-Glycan biosynthesis	0.621064575

Natural killer cell mediated cytotoxicity	0.076679118
Neuroactive ligand-receptor interaction	-0.429576852
Neurotrophin signaling pathway	0.324296709
NF-kappa B signaling pathway	0.158826512
Nicotinate and nicotinamide metabolism	-0.113139544
Nitrogen metabolism	0.588268487
NOD-like receptor signaling pathway	0.121350597
Non-alcoholic fatty liver disease (NAFLD)	0.210993015
Non-small cell lung cancer	0.472126192
Notch signaling pathway	0.414227326
One carbon pool by folate	0.770288589
Oocyte meiosis	0.544447929
Osteoclast differentiation	0.109551628
Ovarian steroidogenesis	-0.021444359
Oxidative phosphorylation	0.491908288
p53 signaling pathway	0.294861884
Pancreatic cancer	0.458442361
Pancreatic secretion	0.052069872
Pantothenate and CoA biosynthesis	0.131563042
Parkinson's disease	0.146265024
Pathogenic Escherichia coli infection	0.257915815
Pentose and glucuronate interconversions	-0.234780677
Pentose phosphate pathway	0.269030059
Peroxisome	0.132439924
Pertussis	0.094206206
Phagosome	1.052433059
Phenylalanine metabolism	-0.133183734
Phenylalanine, tyrosine and tryptophan biosynthesis	0.312121452
Phosphatidylinositol signaling system	1.261181063
Phospholipase D signaling pathway	0.340899595
Phosphonate and phosphinate metabolism	0.127518546
Phototransduction	-0.420051712
Platelet activation	0.223045366
Platinum drug resistance	0.398673183
Porphyrin and chlorophyll metabolism	0.008139268
Primary bile acid biosynthesis	-0.280237708
Prion diseases	0.318775383
Progesterone-mediated oocyte maturation	0.218607676
Prolactin signaling pathway	0.326163999
Propanoate metabolism	0.328695991
Prostate cancer	0.470023086
Protein processing in endoplasmic reticulum	0.405431951
Proximal tubule bicarbonate reclamation	0.162527305
Pyrimidine metabolism	1.057830643
Pyruvate metabolism	0.491614882
Regulation of lipolysis in adipocytes	0.197224455

Renal cell carcinoma	0.432104675
Renin secretion	0.200134199
Renin-angiotensin system	-0.129664433
Retinol metabolism	-1.736400858
Retrograde endocannabinoid signaling	0.090162519
Rheumatoid arthritis	-0.199199985
Riboflavin metabolism	0.397104185
Ribosome biogenesis in eukaryotes	0.300778781
RIG-I-like receptor signaling pathway	0.268611666
RNA degradation	0.688470387
RNA transport	0.381774112
Salivary secretion	0.039429700
Salmonella infection	0.382235102
Selenocompound metabolism	0.355026066
Serotonergic synapse	-0.154672329
Shigellosis	0.331396593
Signaling pathways regulating pluripotency of stem cells	0.360164059
Small cell lung cancer	0.595117640
SNARE interactions in vesicular transport	0.402870397
Sphingolipid metabolism	0.703572547
Sphingolipid signaling pathway	0.435001923
Staphylococcus aureus infection	-0.154851397
Starch and sucrose metabolism	0.393147395
Steroid biosynthesis	0.396642536
Steroid hormone biosynthesis	-1.055984574
Sulfur metabolism	0.505142418
Sulfur relay system	0.287801463
Synaptic vesicle cycle	0.586968957
Synthesis and degradation of ketone bodies	0.162796648
Systemic lupus erythematosus	-0.292570779
T cell receptor signaling pathway	0.190783409
Taste transduction	-0.364165583
Taurine and hypotaurine metabolism	-0.285172827
Terpenoid backbone biosynthesis	0.353681162
TGF-beta signaling pathway	0.229341761
Th1 and Th2 cell differentiation	-0.080634479
Th17 cell differentiation	0.111388073
Thiamine metabolism	0.159211706
Thyroid cancer	0.364098843
Thyroid hormone signaling pathway	0.603895442
Thyroid hormone synthesis	-0.037398211
Tight junction	-0.014830200
TNF signaling pathway	0.295191784
Toll-like receptor signaling pathway	0.084104035
Toxoplasmosis	0.247417484
Transcriptional misregulation in cancer	0.086667593

Tryptophan metabolism	-0.287056574
Type I diabetes mellitus	-0.428330960
Type II diabetes mellitus	0.172615899
Tyrosine metabolism	-0.390064054
Ubiquinone and other terpenoid-quinone biosynthesis	0.284043750
Valine, leucine and isoleucine degradation	0.547215351
Vascular smooth muscle contraction	0.174740595
Vasopressin-regulated water reabsorption	0.027051134
VEGF signaling pathway	0.303816800
Vibrio cholerae infection	0.401464804
Viral carcinogenesis	0.328672717
Viral myocarditis	0.134274120
Vitamin B6 metabolism	0.134505375
Vitamin digestion and absorption	-0.499077576
Wnt signaling pathway	0.188979227

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Acute myeloid leukemia	0.4399032547
Adherens junction	0.5590001648
Adipocytokine signaling pathway	0.2391685507
Adrenergic signaling in cardiomyocytes	-0.3369070602
African trypanosomiasis	-0.2299384061
AGE-RAGE signaling pathway in diabetic complications	0.2666558544
Alanine, aspartate and glutamate metabolism	0.5444257937
Aldosterone synthesis and secretion	0.1008504567
Aldosterone-regulated sodium reabsorption	0.1640505084
Allograft rejection	-0.1701443677
alpha-Linolenic acid metabolism	0.0641153035
Alzheimer's disease	0.3017687756
Amino sugar and nucleotide sugar metabolism	0.4703422224
Aminoacyl-tRNA biosynthesis	0.2770088999
Amoebiasis	-0.0805529932
Amphetamine addiction	-0.1291350680
AMPK signaling pathway	0.4702769768
Amyotrophic lateral sclerosis (ALS)	0.1777200113
Antifolate resistance	0.0412452148
Antigen processing and presentation	-0.0551173785
Apelin signaling pathway	0.2618059914
Apoptosis	0.3377220900
Arachidonic acid metabolism	-0.7553344810
Arginine and proline metabolism	-0.0096472505
Arginine biosynthesis	0.2695117470
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.3359200000
Ascorbate and aldarate metabolism	-0.5950531437
Asthma	-0.4267607661
Autoimmune thyroid disease	-0.4063113099
Autophagy - animal	0.5068227973

Autophagy - other	0.6248674131
B cell receptor signaling pathway	0.1282431144
Bacterial invasion of epithelial cells	0.4650764149
Basal cell carcinoma	0.1815203371
beta-Alanine metabolism	-0.1935248605
Bile secretion	-0.0283995013
Biosynthesis of unsaturated fatty acids	0.1666797709
Biotin metabolism	0.2628893247
Bladder cancer	0.4680597291
Breast cancer	0.3914336781
Butanoate metabolism	0.2048316342
Caffeine metabolism	-0.4443907481
Carbohydrate digestion and absorption	0.1502737942
Cardiac muscle contraction	-0.1902011570
Cell adhesion molecules (CAMs)	-0.2145961527
Cell cycle	0.8317563727
Central carbon metabolism in cancer	0.5543752144
Chagas disease (American trypanosomiasis)	0.3087988330
Chemical carcinogenesis	-0.8673645733
Choline metabolism in cancer	0.3345347254
Cholinergic synapse	0.1083354461
Chronic myeloid leukemia	0.5717369440
Circadian entrainment	-0.0247616314
Circadian rhythm	0.4546429984
Citrate cycle (TCA cycle)	0.9218041223
Cocaine addiction	0.0134970148
Colorectal cancer	0.4009093017
Complement and coagulation cascades	-0.2083164732
Cysteine and methionine metabolism	0.4961113976
Cytosolic DNA-sensing pathway	0.2345307999
D-Glutamine and D-glutamate metabolism	0.3140288491
Dilated cardiomyopathy	0.2261739997
Dopaminergic synapse	0.0263061873
Dorso-ventral axis formation	0.2659491341
Drug metabolism - cytochrome P450	-0.5033214291
Drug metabolism - other enzymes	0.0946262582
ECM-receptor interaction	0.4527789922
EGFR tyrosine kinase inhibitor resistance	0.5161014894
Endocrine and other factor-regulated calcium reabsorption	-0.1276545306
Endocrine resistance	0.4725479747
Endocytosis	0.6819596651
Endometrial cancer	0.5097036464
Epithelial cell signaling in Helicobacter pylori infection	0.1394378706
Epstein-Barr virus infection	0.3544625631
ErbB signaling pathway	0.3666760652
Estrogen signaling pathway	0.2223191472

Ether lipid metabolism	0.0519714318
Fanconi anemia pathway	0.5513684849
Fat digestion and absorption	0.3645417710
Fatty acid biosynthesis	0.3497753748
Fatty acid degradation	0.6477894176
Fatty acid elongation	0.2624137631
Fc epsilon RI signaling pathway	0.2356864101
Fc gamma R-mediated phagocytosis	0.3788223242
Ferroptosis	0.2779947795
Fluid shear stress and atherosclerosis	0.3496725088
Folate biosynthesis	0.2818379632
FoxO signaling pathway	0.3138143703
Fructose and mannose metabolism	0.4774927529
GABAergic synapse	-0.4524315868
Galactose metabolism	0.4215179545
Gap junction	0.1118954100
Gastric acid secretion	0.1540721668
Glioma	0.4359690776
Glucagon signaling pathway	0.4147022228
Glutamatergic synapse	-0.1438617793
Glutathione metabolism	0.2661211238
Glycerolipid metabolism	0.7391946972
Glycerophospholipid metabolism	0.7863418256
Glycine, serine and threonine metabolism	-0.0179176990
Glycolysis / Gluconeogenesis	0.5276117119
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.4299757293
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.4025722487
Glycosaminoglycan degradation	0.4015442019
Glycosphingolipid biosynthesis - ganglio series	0.2582798761
Glycosphingolipid biosynthesis - globo and isoglobo series	-0.0916228333
Glycosphingolipid biosynthesis - lacto and neolacto series	-0.4738307659
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.4371498736
Glyoxylate and dicarboxylate metabolism	0.2863945823
GnRH signaling pathway	0.2498540061
Graft-versus-host disease	-0.2911876570
Hedgehog signaling pathway	0.2253946803
Hepatitis B	0.3106686127
Hepatitis C	0.4128849733
Herpes simplex infection	0.3018428453
HIF-1 signaling pathway	0.5457209088
Hippo signaling pathway -multiple species	0.3407674557
Histidine metabolism	-0.3224856274
Homologous recombination	0.1954146241
Huntington's disease	0.7866363754
Hypertrophic cardiomyopathy (HCM)	0.2383919025
IL-17 signaling pathway	0.2165378373

Inflammatory bowel disease (IBD)	-0.1901316067
Inflammatory mediator regulation of TRP channels	0.1237844335
Influenza A	0.2892725596
Inositol phosphate metabolism	1.0320042344
Insulin resistance	0.3911348584
Insulin secretion	-0.1233796555
Insulin signaling pathway	0.4730258221
Intestinal immune network for IgA production	-0.1934521091
Legionellosis	-0.0985193588
Leishmaniasis	-0.0413365995
Leukocyte transendothelial migration	0.1166799106
Linoleic acid metabolism	-1.3141671432
Lipoic acid metabolism	-0.1733784306
Long-term depression	0.2355184001
Long-term potentiation	0.1787592978
Longevity regulating pathway	0.6105915647
Longevity regulating pathway - multiple species	0.5785437411
Lysine biosynthesis	-0.1246100382
Lysine degradation	0.6109861832
Malaria	-0.2542243282
Mannose type O-glycan biosynthesis	0.3501558274
Maturity onset diabetes of the young	-0.1635253406
Measles	0.1889594666
Melanogenesis	0.1772373191
Melanoma	0.2871505896
Metabolism of xenobiotics by cytochrome P450	-1.1415756997
Mineral absorption	-0.0202196332
Mitophagy - animal	0.3253179683
Morphine addiction	-0.2829089731
mRNA surveillance pathway	0.5742015331
mTOR signaling pathway	0.5053667486
Mucin type O-glycan biosynthesis	-0.3286478639
N-Glycan biosynthesis	0.6238003889
Natural killer cell mediated cytotoxicity	0.0910243595
Neuroactive ligand-receptor interaction	-0.4221070132
Neurotrophin signaling pathway	0.3358548321
NF-kappa B signaling pathway	0.1611503527
Nicotinate and nicotinamide metabolism	-0.0778018653
Nitrogen metabolism	0.5888895101
NOD-like receptor signaling pathway	0.1286087361
Non-alcoholic fatty liver disease (NAFLD)	0.2174669490
Non-small cell lung cancer	0.4782427027
Notch signaling pathway	0.4249329682
One carbon pool by folate	0.8290669983
Oocyte meiosis	0.5464773815
Osteoclast differentiation	0.1156849577

Ovarian steroidogenesis	0.0242089560
Oxidative phosphorylation	0.5034466021
p53 signaling pathway	0.2988621220
Pancreatic cancer	0.4643835987
Pancreatic secretion	0.0961171946
Pantothenate and CoA biosynthesis	0.1394999224
Parkinson's disease	0.1674249849
Pathogenic Escherichia coli infection	0.2792586576
Pentose and glucuronate interconversions	-0.2092580386
Pentose phosphate pathway	0.3393966123
Peroxisome	0.1327167326
Pertussis	0.1016059404
Phagosome	1.0733708127
Phenylalanine metabolism	-0.1297075576
Phenylalanine, tyrosine and tryptophan biosynthesis	0.3136481617
Phosphatidylinositol signaling system	1.2735669632
Phospholipase D signaling pathway	0.3413491809
Phosphonate and phosphinate metabolism	0.1278356196
Phototransduction	-0.3930420214
Platelet activation	0.2293669116
Platinum drug resistance	0.4038854979
Porphyrin and chlorophyll metabolism	0.0210607705
Primary bile acid biosynthesis	-0.2751590338
Prion diseases	0.3207653449
Progesterone-mediated oocyte maturation	0.2224723981
Prolactin signaling pathway	0.3413761252
Propanoate metabolism	0.3347510209
Prostate cancer	0.4738494508
Protein processing in endoplasmic reticulum	0.4201471059
Proximal tubule bicarbonate reclamation	0.1627391360
Pyrimidine metabolism	1.0912125823
Pyruvate metabolism	0.5083408617
Regulation of lipolysis in adipocytes	0.2079799480
Renal cell carcinoma	0.4360226931
Renin secretion	0.2113965839
Renin-angiotensin system	0.0005793112
Retinol metabolism	-1.7244591763
Retrograde endocannabinoid signaling	0.0988554180
Rheumatoid arthritis	-0.1968372236
Riboflavin metabolism	0.4404921218
Ribosome biogenesis in eukaryotes	0.3048759259
RIG-I-like receptor signaling pathway	0.2748282238
RNA degradation	0.6902243958
RNA transport	0.3885216659
Salivary secretion	0.0553423809
Salmonella infection	0.3874935109

Selenocompound metabolism	0.3577592209
Serotonergic synapse	-0.0973316392
Shigellosis	0.3455303084
Signaling pathways regulating pluripotency of stem cells	0.3690274658
Small cell lung cancer	0.5975754299
SNARE interactions in vesicular transport	0.4079168831
Sphingolipid metabolism	0.7296131900
Sphingolipid signaling pathway	0.4446853969
Staphylococcus aureus infection	-0.1491245717
Starch and sucrose metabolism	0.3959775401
Steroid biosynthesis	0.4066492381
Steroid hormone biosynthesis	-1.0102588646
Sulfur metabolism	0.5076566802
Sulfur relay system	0.2897874329
Synaptic vesicle cycle	0.5894207927
Synthesis and degradation of ketone bodies	0.1865236147
Systemic lupus erythematosus	-0.2740805295
T cell receptor signaling pathway	0.1920413024
Taste transduction	-0.3617243340
Taurine and hypotaurine metabolism	-0.2733968912
Terpenoid backbone biosynthesis	0.3612941278
TGF-beta signaling pathway	0.2351650235
Th1 and Th2 cell differentiation	-0.0744094895
Th17 cell differentiation	0.1193496297
Thiamine metabolism	0.1644307918
Thyroid cancer	0.3735974615
Thyroid hormone signaling pathway	0.6185446584
Thyroid hormone synthesis	-0.0145460520
Tight junction	0.0074569419
TNF signaling pathway	0.2999690867
Toll-like receptor signaling pathway	0.0864876454
Toxoplasmosis	0.2525002486
Transcriptional misregulation in cancer	0.0904195253
Tryptophan metabolism	-0.2737150546
Type I diabetes mellitus	-0.4157022898
Type II diabetes mellitus	0.1799240248
Tyrosine metabolism	-0.3835306145
Ubiquinone and other terpenoid-quinone biosynthesis	0.2857841242
Valine, leucine and isoleucine degradation	0.5630305003
Vascular smooth muscle contraction	0.1891430316
Vasopressin-regulated water reabsorption	0.0436653457
VEGF signaling pathway	0.3137765530
Vibrio cholerae infection	0.4023428401
Viral carcinogenesis	0.3303511875
Viral myocarditis	0.1487754208
Vitamin B6 metabolism	0.1492324473

Vitamin digestion and absorption	-0.4696246273
Wnt signaling pathway	0.2124738939
	control.Mean
Acute myeloid leukemia	0.438095294
Adherens junction	0.557968597
Adipocytokine signaling pathway	0.239489539
Adrenergic signaling in cardiomyocytes	-0.338836265
African trypanosomiasis	-0.229057476
AGE-RAGE signaling pathway in diabetic complications	0.255489001
Alanine, aspartate and glutamate metabolism	0.546251357
Aldosterone synthesis and secretion	0.093406830
Aldosterone-regulated sodium reabsorption	0.163215416
Allograft rejection	-0.170656255
alpha-Linolenic acid metabolism	0.068669149
Alzheimer's disease	0.293734987
Amino sugar and nucleotide sugar metabolism	0.468252959
Aminoacyl-tRNA biosynthesis	0.278379678
Amoebiasis	-0.077169770
Amphetamine addiction	-0.130108428
AMPK signaling pathway	0.472638969
Amyotrophic lateral sclerosis (ALS)	0.177204228
Antifolate resistance	0.040620555
Antigen processing and presentation	-0.054663672
Apelin signaling pathway	0.272146645
Apoptosis	0.337074934
Arachidonic acid metabolism	-0.754486801
Arginine and proline metabolism	-0.004254250
Arginine biosynthesis	0.272462856
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.336534861
Ascorbate and aldarate metabolism	-0.597644419
Asthma	-0.425239743
Autoimmune thyroid disease	-0.408814230
Autophagy - animal	0.506684035
Autophagy - other	0.626736040
B cell receptor signaling pathway	0.127547339
Bacterial invasion of epithelial cells	0.463575046
Basal cell carcinoma	0.181285878
beta-Alanine metabolism	-0.213427179
Bile secretion	-0.030383766
Biosynthesis of unsaturated fatty acids	0.166938719
Biotin metabolism	0.262734285
Bladder cancer	0.467697109
Breast cancer	0.392597599
Butanoate metabolism	0.189550560
Caffeine metabolism	-0.451444331
Carbohydrate digestion and absorption	0.148383347

Cardiac muscle contraction	-0.189068930
Cell adhesion molecules (CAMs)	-0.213940024
Cell cycle	0.831654287
Central carbon metabolism in cancer	0.551598130
Chagas disease (American trypanosomiasis)	0.307152396
Chemical carcinogenesis	-0.879886191
Choline metabolism in cancer	0.335696329
Cholinergic synapse	0.104056950
Chronic myeloid leukemia	0.574814640
Circadian entrainment	-0.041444798
Circadian rhythm	0.455033196
Citrate cycle (TCA cycle)	0.949275416
Cocaine addiction	0.004419946
Colorectal cancer	0.402060834
Complement and coagulation cascades	-0.202142079
Cysteine and methionine metabolism	0.494488819
Cytosolic DNA-sensing pathway	0.237246990
D-Glutamine and D-glutamate metabolism	0.314282326
Dilated cardiomyopathy	0.229804890
Dopaminergic synapse	0.026339411
Dorso-ventral axis formation	0.265501728
Drug metabolism - cytochrome P450	-0.497073087
Drug metabolism - other enzymes	0.082992948
ECM-receptor interaction	0.474654675
EGFR tyrosine kinase inhibitor resistance	0.513811818
Endocrine and other factor-regulated calcium reabsorption	-0.123271631
Endocrine resistance	0.475645556
Endocytosis	0.678677928
Endometrial cancer	0.511057721
Epithelial cell signaling in Helicobacter pylori infection	0.137633016
Epstein-Barr virus infection	0.352104188
ErbB signaling pathway	0.368226856
Estrogen signaling pathway	0.220244208
Ether lipid metabolism	0.087480575
Fanconi anemia pathway	0.546536018
Fat digestion and absorption	0.362208989
Fatty acid biosynthesis	0.349540516
Fatty acid degradation	0.629346317
Fatty acid elongation	0.265766156
Fc epsilon RI signaling pathway	0.239640826
Fc gamma R-mediated phagocytosis	0.369880521
Ferroptosis	0.277673551
Fluid shear stress and atherosclerosis	0.345122479
Folate biosynthesis	0.281873968
FoxO signaling pathway	0.315118787
Fructose and mannose metabolism	0.447125140

GABAergic synapse	-0.454048094
Galactose metabolism	0.420065354
Gap junction	0.103421593
Gastric acid secretion	0.145782803
Glioma	0.431624116
Glucagon signaling pathway	0.426783180
Glutamatergic synapse	-0.144359806
Glutathione metabolism	0.272537898
Glycerolipid metabolism	0.735987572
Glycerophospholipid metabolism	0.790880343
Glycine, serine and threonine metabolism	0.009558979
Glycolysis / Gluconeogenesis	0.531339218
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.430419653
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.403365386
Glycosaminoglycan degradation	0.400903611
Glycosphingolipid biosynthesis - ganglio series	0.260317907
Glycosphingolipid biosynthesis - globo and isoglobo series	-0.086314830
Glycosphingolipid biosynthesis - lacto and neolacto series	-0.476456548
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.433315473
Glyoxylate and dicarboxylate metabolism	0.288686643
GnRH signaling pathway	0.247855861
Graft-versus-host disease	-0.275475010
Hedgehog signaling pathway	0.227965872
Hepatitis B	0.312364269
Hepatitis C	0.414332373
Herpes simplex infection	0.302483470
HIF-1 signaling pathway	0.542750793
Hippo signaling pathway -multiple species	0.342365464
Histidine metabolism	-0.322510867
Homologous recombination	0.194622663
Huntington's disease	0.781705986
Hypertrophic cardiomyopathy (HCM)	0.238506238
IL-17 signaling pathway	0.217103249
Inflammatory bowel disease (IBD)	-0.190413555
Inflammatory mediator regulation of TRP channels	0.119478840
Influenza A	0.285886685
Inositol phosphate metabolism	1.045041098
Insulin resistance	0.387380054
Insulin secretion	-0.127152215
Insulin signaling pathway	0.474916316
Intestinal immune network for IgA production	-0.193573634
Legionellosis	-0.089409541
Leishmaniasis	-0.040363027
Leukocyte transendothelial migration	0.114104975
Linoleic acid metabolism	-1.296893743
Lipoic acid metabolism	-0.178694522

Long-term depression	0.234982777
Long-term potentiation	0.172390885
Longevity regulating pathway	0.611970032
Longevity regulating pathway - multiple species	0.583246191
Lysine biosynthesis	-0.126431972
Lysine degradation	0.616481683
Malaria	-0.223791481
Mannose type O-glycan biosynthesis	0.349292456
Maturity onset diabetes of the young	-0.166920045
Measles	0.186777373
Melanogenesis	0.165716087
Melanoma	0.272896370
Metabolism of xenobiotics by cytochrome P450	-1.132306025
Mineral absorption	-0.020436569
Mitophagy - animal	0.331261046
Morphine addiction	-0.291053659
mRNA surveillance pathway	0.577213397
mTOR signaling pathway	0.499285898
Mucin type O-glycan biosynthesis	-0.323964625
N-Glycan biosynthesis	0.623084581
Natural killer cell mediated cytotoxicity	0.087398552
Neuroactive ligand-receptor interaction	-0.421743991
Neurotrophin signaling pathway	0.335024695
NF-kappa B signaling pathway	0.165254526
Nicotinate and nicotinamide metabolism	-0.096995167
Nitrogen metabolism	0.588721450
NOD-like receptor signaling pathway	0.124738426
Non-alcoholic fatty liver disease (NAFLD)	0.216265395
Non-small cell lung cancer	0.477252142
Notch signaling pathway	0.421037536
One carbon pool by folate	0.814138093
Oocyte meiosis	0.549132099
Osteoclast differentiation	0.115838111
Ovarian steroidogenesis	0.038167590
Oxidative phosphorylation	0.499993304
p53 signaling pathway	0.307034808
Pancreatic cancer	0.463719565
Pancreatic secretion	0.103598665
Pantothenate and CoA biosynthesis	0.135130855
Parkinson's disease	0.160419068
Pathogenic Escherichia coli infection	0.278119984
Pentose and glucuronate interconversions	-0.224020155
Pentose phosphate pathway	0.297519602
Peroxisome	0.132842730
Pertussis	0.107240878
Phagosome	1.079108836

Phenylalanine metabolism	-0.120265693
Phenylalanine, tyrosine and tryptophan biosynthesis	0.313529310
Phosphatidylinositol signaling system	1.304902869
Phospholipase D signaling pathway	0.345953842
Phosphonate and phosphinate metabolism	0.127715782
Phototransduction	-0.404015612
Platelet activation	0.236921706
Platinum drug resistance	0.403192173
Porphyrin and chlorophyll metabolism	0.020129905
Primary bile acid biosynthesis	-0.274731575
Prion diseases	0.320153016
Progesterone-mediated oocyte maturation	0.222052051
Prolactin signaling pathway	0.339521600
Propanoate metabolism	0.332919391
Prostate cancer	0.483506883
Protein processing in endoplasmic reticulum	0.412618504
Proximal tubule bicarbonate reclamation	0.186641303
Pyrimidine metabolism	1.095896841
Pyruvate metabolism	0.519417085
Regulation of lipolysis in adipocytes	0.214396520
Renal cell carcinoma	0.433178233
Renin secretion	0.213198819
Renin-angiotensin system	0.001283536
Retinol metabolism	-1.732326159
Retrograde endocannabinoid signaling	0.104184430
Rheumatoid arthritis	-0.184850663
Riboflavin metabolism	0.399147987
Ribosome biogenesis in eukaryotes	0.305223533
RIG-I-like receptor signaling pathway	0.272642674
RNA degradation	0.690911544
RNA transport	0.390640716
Salivary secretion	0.051268772
Salmonella infection	0.392140827
Selenocompound metabolism	0.372689549
Serotonergic synapse	-0.099675404
Shigellosis	0.345810308
Signaling pathways regulating pluripotency of stem cells	0.368784733
Small cell lung cancer	0.597171824
SNARE interactions in vesicular transport	0.409333385
Sphingolipid metabolism	0.755663585
Sphingolipid signaling pathway	0.442362945
Staphylococcus aureus infection	-0.139759180
Starch and sucrose metabolism	0.395061474
Steroid biosynthesis	0.401246223
Steroid hormone biosynthesis	-1.006634985
Sulfur metabolism	0.506820798

Sulfur relay system	0.288464016
Synaptic vesicle cycle	0.589116029
Synthesis and degradation of ketone bodies	0.168232984
Systemic lupus erythematosus	-0.270925653
T cell receptor signaling pathway	0.193697071
Taste transduction	-0.361579687
Taurine and hypotaurine metabolism	-0.272078416
Terpenoid backbone biosynthesis	0.363208001
TGF-beta signaling pathway	0.232887302
Th1 and Th2 cell differentiation	-0.076093833
Th17 cell differentiation	0.121424945
Thiamine metabolism	0.165608528
Thyroid cancer	0.368103771
Thyroid hormone signaling pathway	0.620053654
Thyroid hormone synthesis	-0.023983964
Tight junction	0.005208946
TNF signaling pathway	0.298458256
Toll-like receptor signaling pathway	0.086109782
Toxoplasmosis	0.254994424
Transcriptional misregulation in cancer	0.089800718
Tryptophan metabolism	-0.275392891
Type I diabetes mellitus	-0.414201865
Type II diabetes mellitus	0.185204324
Tyrosine metabolism	-0.370930994
Ubiquinone and other terpenoid-quinone biosynthesis	0.285929776
Valine, leucine and isoleucine degradation	0.550733327
Vascular smooth muscle contraction	0.187946302
Vasopressin-regulated water reabsorption	0.029112693
VEGF signaling pathway	0.311554257
Vibrio cholerae infection	0.401966851
Viral carcinogenesis	0.329405687
Viral myocarditis	0.142987091
Vitamin B6 metabolism	0.145731355
Vitamin digestion and absorption	-0.473332363
Wnt signaling pathway	0.219736711
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Acute myeloid leukemia	0.441392120
Adherens junction	0.559541438
Adipocytokine signaling pathway	0.251421996
Adrenergic signaling in cardiomyocytes	-0.326822906
African trypanosomiasis	-0.221427360
AGE-RAGE signaling pathway in diabetic complications	0.272835660
Alanine, aspartate and glutamate metabolism	0.552873046
Aldosterone synthesis and secretion	0.147920732
Aldosterone-regulated sodium reabsorption	0.174925081
Allograft rejection	-0.168194574

alpha-Linolenic acid metabolism	0.078400814
Alzheimer's disease	0.302674259
Amino sugar and nucleotide sugar metabolism	0.472888257
Aminoacyl-tRNA biosynthesis	0.290815250
Amoebiasis	-0.049266901
Amphetamine addiction	-0.119590475
AMPK signaling pathway	0.476527487
Amyotrophic lateral sclerosis (ALS)	0.180585045
Antifolate resistance	0.042604902
Antigen processing and presentation	-0.037934501
Apelin signaling pathway	0.273468990
Apoptosis	0.343943126
Arachidonic acid metabolism	-0.742238962
Arginine and proline metabolism	0.001743145
Arginine biosynthesis	0.277882432
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.340798307
Ascorbate and aldarate metabolism	-0.584725255
Asthma	-0.417122288
Autoimmune thyroid disease	-0.395080373
Autophagy - animal	0.508287929
Autophagy - other	0.630333414
B cell receptor signaling pathway	0.135705126
Bacterial invasion of epithelial cells	0.476600923
Basal cell carcinoma	0.199924110
beta-Alanine metabolism	-0.182313472
Bile secretion	-0.015748461
Biosynthesis of unsaturated fatty acids	0.169882018
Biotin metabolism	0.263403969
Bladder cancer	0.477969488
Breast cancer	0.398047149
Butanoate metabolism	0.207877959
Caffeine metabolism	-0.434966223
Carbohydrate digestion and absorption	0.166152178
Cardiac muscle contraction	-0.184647122
Cell adhesion molecules (CAMs)	-0.206755512
Cell cycle	0.852608857
Central carbon metabolism in cancer	0.559419524
Chagas disease (American trypanosomiasis)	0.320793664
Chemical carcinogenesis	-0.858790647
Choline metabolism in cancer	0.337576596
Cholinergic synapse	0.124143071
Chronic myeloid leukemia	0.577653524
Circadian entrainment	0.001393755
Circadian rhythm	0.458596789
Citrate cycle (TCA cycle)	0.951703950
Cocaine addiction	0.016442302

Colorectal cancer	0.408966260
Complement and coagulation cascades	-0.199554730
Cysteine and methionine metabolism	0.498125299
Cytosolic DNA-sensing pathway	0.238857962
D-Glutamine and D-glutamate metabolism	0.314631378
Dilated cardiomyopathy	0.239312207
Dopaminergic synapse	0.056097051
Dorso-ventral axis formation	0.266688277
Drug metabolism - cytochrome P450	-0.492867703
Drug metabolism - other enzymes	0.095173065
ECM-receptor interaction	0.511100030
EGFR tyrosine kinase inhibitor resistance	0.522830044
Endocrine and other factor-regulated calcium reabsorption	-0.116649404
Endocrine resistance	0.481511159
Endocytosis	0.687493758
Endometrial cancer	0.525219975
Epithelial cell signaling in Helicobacter pylori infection	0.140560797
Epstein-Barr virus infection	0.356895137
ErbB signaling pathway	0.377365315
Estrogen signaling pathway	0.237276706
Ether lipid metabolism	0.094922355
Fanconi anemia pathway	0.558512522
Fat digestion and absorption	0.368344846
Fatty acid biosynthesis	0.350373327
Fatty acid degradation	0.662666542
Fatty acid elongation	0.267566364
Fc epsilon RI signaling pathway	0.241261027
Fc gamma R-mediated phagocytosis	0.383281208
Ferroptosis	0.278025820
Fluid shear stress and atherosclerosis	0.352014077
Folate biosynthesis	0.289179355
FoxO signaling pathway	0.319173188
Fructose and mannose metabolism	0.482135077
GABAergic synapse	-0.444662053
Galactose metabolism	0.423472308
Gap junction	0.116930613
Gastric acid secretion	0.167589887
Glioma	0.436962209
Glucagon signaling pathway	0.459156313
Glutamatergic synapse	-0.114475857
Glutathione metabolism	0.282348390
Glycerolipid metabolism	0.760903223
Glycerophospholipid metabolism	0.835648917
Glycine, serine and threonine metabolism	0.013002034
Glycolysis / Gluconeogenesis	0.546201814
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.431188517

Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.404145536
Glycosaminoglycan degradation	0.423996324
Glycosphingolipid biosynthesis - ganglio series	0.266971970
Glycosphingolipid biosynthesis - globo and isoglobo series	-0.085134875
Glycosphingolipid biosynthesis - lacto and neolacto series	-0.468531106
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.445800017
Glyoxylate and dicarboxylate metabolism	0.310783174
GnRH signaling pathway	0.264044025
Graft-versus-host disease	-0.270216719
Hedgehog signaling pathway	0.236593750
Hepatitis B	0.324301296
Hepatitis C	0.419619758
Herpes simplex infection	0.305579718
HIF-1 signaling pathway	0.558146271
Hippo signaling pathway -multiple species	0.352809673
Histidine metabolism	-0.313729153
Homologous recombination	0.198156139
Huntington's disease	0.788634269
Hypertrophic cardiomyopathy (HCM)	0.239058025
IL-17 signaling pathway	0.223177224
Inflammatory bowel disease (IBD)	-0.187793222
Inflammatory mediator regulation of TRP channels	0.132227822
Influenza A	0.298734202
Inositol phosphate metabolism	1.071386368
Insulin resistance	0.393416087
Insulin secretion	-0.111959318
Insulin signaling pathway	0.478658758
Intestinal immune network for IgA production	-0.190876669
Legionellosis	-0.088662735
Leishmaniasis	-0.037562701
Leukocyte transendothelial migration	0.118893276
Linoleic acid metabolism	-1.286517837
Lipoic acid metabolism	-0.172001921
Long-term depression	0.277113595
Long-term potentiation	0.205259235
Longevity regulating pathway	0.620853742
Longevity regulating pathway - multiple species	0.589933784
Lysine biosynthesis	-0.113904939
Lysine degradation	0.617115571
Malaria	-0.220397007
Mannose type O-glycan biosynthesis	0.363493685
Maturity onset diabetes of the young	-0.160470996
Measles	0.197372133
Melanogenesis	0.182909272
Melanoma	0.306276759
Metabolism of xenobiotics by cytochrome P450	-1.120223787

Mineral absorption	-0.011000149
Mitophagy - animal	0.334538709
Morphine addiction	-0.262032174
mRNA surveillance pathway	0.579375227
mTOR signaling pathway	0.509010677
Mucin type O-glycan biosynthesis	-0.242779980
N-Glycan biosynthesis	0.625820395
Natural killer cell mediated cytotoxicity	0.101743793
Neuroactive ligand-receptor interaction	-0.414274152
Neurotrophin signaling pathway	0.346582818
NF-kappa B signaling pathway	0.167578367
Nicotinate and nicotinamide metabolism	-0.061657488
Nitrogen metabolism	0.589342473
NOD-like receptor signaling pathway	0.131996565
Non-alcoholic fatty liver disease (NAFLD)	0.222739329
Non-small cell lung cancer	0.483368653
Notch signaling pathway	0.431743178
One carbon pool by folate	0.872916502
Oocyte meiosis	0.551161551
Osteoclast differentiation	0.121971441
Ovarian steroidogenesis	0.083820905
Oxidative phosphorylation	0.511531618
p53 signaling pathway	0.311035046
Pancreatic cancer	0.469660802
Pancreatic secretion	0.147645987
Pantothenate and CoA biosynthesis	0.143067735
Parkinson's disease	0.181579029
Pathogenic Escherichia coli infection	0.299462826
Pentose and glucuronate interconversions	-0.198497517
Pentose phosphate pathway	0.367886156
Peroxisome	0.133119539
Pertussis	0.114640612
Phagosome	1.100046590
Phenylalanine metabolism	-0.116789516
Phenylalanine, tyrosine and tryptophan biosynthesis	0.315056020
Phosphatidylinositol signaling system	1.317288770
Phospholipase D signaling pathway	0.346403428
Phosphonate and phosphinate metabolism	0.128032855
Phototransduction	-0.377005922
Platelet activation	0.243243252
Platinum drug resistance	0.408404488
Porphyrin and chlorophyll metabolism	0.033051407
Primary bile acid biosynthesis	-0.269652901
Prion diseases	0.322142977
Progesterone-mediated oocyte maturation	0.225916773
Prolactin signaling pathway	0.354733726

Propanoate metabolism	0.338974421
Prostate cancer	0.487333247
Protein processing in endoplasmic reticulum	0.427333658
Proximal tubule bicarbonate reclamation	0.186853134
Pyrimidine metabolism	1.129278780
Pyruvate metabolism	0.536143065
Regulation of lipolysis in adipocytes	0.225152013
Renal cell carcinoma	0.437096252
Renin secretion	0.224461204
Renin-angiotensin system	0.131527281
Retinol metabolism	-1.720384478
Retrograde endocannabinoid signaling	0.112877329
Rheumatoid arthritis	-0.182487902
Riboflavin metabolism	0.442535924
Ribosome biogenesis in eukaryotes	0.309320677
RIG-I-like receptor signaling pathway	0.278859232
RNA degradation	0.692665553
RNA transport	0.397388271
Salivary secretion	0.067181453
Salmonella infection	0.397399236
Selenocompound metabolism	0.375422704
Serotonergic synapse	-0.042334714
Shigellosis	0.359944023
Signaling pathways regulating pluripotency of stem cells	0.377648139
Small cell lung cancer	0.599629614
SNARE interactions in vesicular transport	0.414379871
Sphingolipid metabolism	0.781704228
Sphingolipid signaling pathway	0.452046418
Staphylococcus aureus infection	-0.134032354
Starch and sucrose metabolism	0.397891619
Steroid biosynthesis	0.411252925
Steroid hormone biosynthesis	-0.960909276
Sulfur metabolism	0.509335060
Sulfur relay system	0.290449986
Synaptic vesicle cycle	0.591567864
Synthesis and degradation of ketone bodies	0.191959950
Systemic lupus erythematosus	-0.252435404
T cell receptor signaling pathway	0.194954964
Taste transduction	-0.359138439
Taurine and hypotaurine metabolism	-0.260302480
Terpenoid backbone biosynthesis	0.370820967
TGF-beta signaling pathway	0.238710564
Th1 and Th2 cell differentiation	-0.069868844
Th17 cell differentiation	0.129386502
Thiamine metabolism	0.170827613
Thyroid cancer	0.377602390

Thyroid hormone signaling pathway	0.634702871
Thyroid hormone synthesis	-0.001131804
Tight junction	0.027496088
TNF signaling pathway	0.303235558
Toll-like receptor signaling pathway	0.088493393
Toxoplasmosis	0.260077188
Transcriptional misregulation in cancer	0.093552650
Tryptophan metabolism	-0.262051371
Type I diabetes mellitus	-0.401573195
Type II diabetes mellitus	0.192512449
Tyrosine metabolism	-0.364397554
Ubiquinone and other terpenoid-quinone biosynthesis	0.287670150
Valine, leucine and isoleucine degradation	0.566548476
Vascular smooth muscle contraction	0.202348739
Vasopressin-regulated water reabsorption	0.045726905
VEGF signaling pathway	0.321514011
Vibrio cholerae infection	0.402844888
Viral carcinogenesis	0.331084158
Viral myocarditis	0.157488392
Vitamin B6 metabolism	0.160458427
Vitamin digestion and absorption	-0.443879415
Wnt signaling pathway	0.243231377

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Acute myeloid leukemia	0.442472047
Adherens junction	0.559580649
Adipocytokine signaling pathway	0.266307342
Adrenergic signaling in cardiomyocytes	-0.317553364
African trypanosomiasis	-0.205788689
AGE-RAGE signaling pathway in diabetic complications	0.273407923
Alanine, aspartate and glutamate metabolism	0.563893233
Aldosterone synthesis and secretion	0.158503591
Aldosterone-regulated sodium reabsorption	0.177325439
Allograft rejection	-0.165269019
alpha-Linolenic acid metabolism	0.120177572
Alzheimer's disease	0.303044938
Amino sugar and nucleotide sugar metabolism	0.473562927
Aminoacyl-tRNA biosynthesis	0.295898240
Amoebiasis	-0.029322213
Amphetamine addiction	-0.114165325
AMPK signaling pathway	0.485651984
Amyotrophic lateral sclerosis (ALS)	0.181378476
Antifolate resistance	0.044197359
Antigen processing and presentation	-0.016657426
Apelin signaling pathway	0.306138365
Apoptosis	0.346657186
Arachidonic acid metabolism	-0.719347962

Arginine and proline metabolism	0.019035876
Arginine biosynthesis	0.288817586
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.343086954
Ascorbate and aldarate metabolism	-0.568277083
Asthma	-0.399902366
Autoimmune thyroid disease	-0.393822893
Autophagy - animal	0.509151749
Autophagy - other	0.642788957
B cell receptor signaling pathway	0.144597548
Bacterial invasion of epithelial cells	0.483356071
Basal cell carcinoma	0.220987101
beta-Alanine metabolism	-0.171970138
Bile secretion	-0.008093730
Biosynthesis of unsaturated fatty acids	0.173300180
Biotin metabolism	0.264112777
Bladder cancer	0.479623102
Breast cancer	0.408381335
Butanoate metabolism	0.211771070
Caffeine metabolism	-0.416493954
Carbohydrate digestion and absorption	0.173172914
Cardiac muscle contraction	-0.181093184
Cell adhesion molecules (CAMs)	-0.202132474
Cell cycle	0.855277590
Central carbon metabolism in cancer	0.559965844
Chagas disease (American trypanosomiasis)	0.326579789
Chemical carcinogenesis	-0.856622913
Choline metabolism in cancer	0.342030681
Cholinergic synapse	0.131811315
Chronic myeloid leukemia	0.587662472
Circadian entrainment	0.010579289
Circadian rhythm	0.462437478
Citrate cycle (TCA cycle)	1.035091596
Cocaine addiction	0.019434452
Colorectal cancer	0.419420553
Complement and coagulation cascades	-0.178999173
Cysteine and methionine metabolism	0.499930516
Cytosolic DNA-sensing pathway	0.247908019
D-Glutamine and D-glutamate metabolism	0.315714294
Dilated cardiomyopathy	0.250897964
Dopaminergic synapse	0.099444077
Dorso-ventral axis formation	0.267520941
Drug metabolism - cytochrome P450	-0.466684738
Drug metabolism - other enzymes	0.096180346
ECM-receptor interaction	0.600177886
EGFR tyrosine kinase inhibitor resistance	0.525403507
Endocrine and other factor-regulated calcium reabsorption	-0.090803352

Endocrine resistance	0.491758225
Endocytosis	0.693919270
Endometrial cancer	0.535461794
Epithelial cell signaling in Helicobacter pylori infection	0.141320864
Epstein-Barr virus infection	0.361733745
ErbB signaling pathway	0.384691146
Estrogen signaling pathway	0.248351206
Ether lipid metabolism	0.207476199
Fanconi anemia pathway	0.567193135
Fat digestion and absorption	0.369227867
Fatty acid biosynthesis	0.350506192
Fatty acid degradation	0.679863037
Fatty acid elongation	0.281618554
Fc epsilon RI signaling pathway	0.253208206
Fc gamma R-mediated phagocytosis	0.384368868
Ferroptosis	0.278056746
Fluid shear stress and atherosclerosis	0.355749251
Folate biosynthesis	0.290138897
FoxO signaling pathway	0.323328840
Fructose and mannose metabolism	0.482842958
GABAergic synapse	-0.444355735
Galactose metabolism	0.427232604
Gap junction	0.118564515
Gastric acid secretion	0.183003790
Glioma	0.438681817
Glucagon signaling pathway	0.507341418
Glutamatergic synapse	-0.103619397
Glutathione metabolism	0.308212540
Glycerolipid metabolism	0.779999522
Glycerophospholipid metabolism	0.884318048
Glycine, serine and threonine metabolism	0.099538054
Glycolysis / Gluconeogenesis	0.566230753
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.433009099
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.406774856
Glycosaminoglycan degradation	0.426787422
Glycosphingolipid biosynthesis - ganglio series	0.277932241
Glycosphingolipid biosynthesis - globo and isoglobo series	-0.066821597
Glycosphingolipid biosynthesis - lacto and neolacto series	-0.459253051
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.445890459
Glyoxylate and dicarboxylate metabolism	0.319240553
GnRH signaling pathway	0.270867522
Graft-versus-host disease	-0.219436178
Hedgehog signaling pathway	0.253341633
Hepatitis B	0.333624920
Hepatitis C	0.426254321
Herpes simplex infection	0.311790219

HIF-1 signaling pathway	0.564594455
Hippo signaling pathway -multiple species	0.359912428
Histidine metabolism	-0.313315068
Homologous recombination	0.201373280
Huntington's disease	0.791133785
Hypertrophic cardiomyopathy (HCM)	0.240804291
IL-17 signaling pathway	0.227357641
Inflammatory bowel disease (IBD)	-0.185058974
Inflammatory mediator regulation of TRP channels	0.133111234
Influenza A	0.307833685
Inositol phosphate metabolism	1.117650783
Insulin resistance	0.400060497
Insulin secretion	-0.100611370
Insulin signaling pathway	0.484351412
Intestinal immune network for IgA production	-0.187615813
Legionellosis	-0.059188400
Leishmaniasis	-0.030061726
Leukocyte transendothelial migration	0.121566231
Linoleic acid metabolism	-1.230025116
Lipoic acid metabolism	-0.169327816
Long-term depression	0.309788629
Long-term potentiation	0.232997559
Longevity regulating pathway	0.633453219
Longevity regulating pathway - multiple species	0.610104061
Lysine biosynthesis	-0.103546626
Lysine degradation	0.633660242
Malaria	-0.121516436
Mannose type O-glycan biosynthesis	0.399030005
Maturity onset diabetes of the young	-0.159502709
Measles	0.199275978
Melanogenesis	0.191029770
Melanoma	0.348930815
Metabolism of xenobiotics by cytochrome P450	-1.075303795
Mineral absorption	-0.004525569
Mitophagy - animal	0.354301274
Morphine addiction	-0.255350696
mRNA surveillance pathway	0.591892448
mTOR signaling pathway	0.509569841
Mucin type O-glycan biosynthesis	-0.227233415
N-Glycan biosynthesis	0.626719055
Natural killer cell mediated cytotoxicity	0.110995073
Neuroactive ligand-receptor interaction	-0.409254917
Neurotrophin signaling pathway	0.349969523
NF-kappa B signaling pathway	0.180837806
Nicotinate and nicotinamide metabolism	-0.040954922
Nitrogen metabolism	0.590095347

NOD-like receptor signaling pathway	0.137494083
Non-alcoholic fatty liver disease (NAFLD)	0.222998055
Non-small cell lung cancer	0.486633665
Notch signaling pathway	0.441650778
One carbon pool by folate	0.886134511
Oocyte meiosis	0.560988197
Osteoclast differentiation	0.124244439
Ovarian steroidogenesis	0.135273014
Oxidative phosphorylation	0.518117356
p53 signaling pathway	0.338138624
Pancreatic cancer	0.471286148
Pancreatic secretion	0.177422071
Pantothenate and CoA biosynthesis	0.145208321
Parkinson's disease	0.185845266
Pathogenic Escherichia coli infection	0.302995627
Pentose and glucuronate interconversions	-0.171355443
Pentose phosphate pathway	0.375924513
Peroxisome	0.134090970
Pertussis	0.145651098
Phagosome	1.122617843
Phenylalanine metabolism	-0.082141092
Phenylalanine, tyrosine and tryptophan biosynthesis	0.318661766
Phosphatidylinositol signaling system	1.427903171
Phospholipase D signaling pathway	0.361498221
Phosphonate and phosphinate metabolism	0.128525921
Phototransduction	-0.334010520
Platelet activation	0.266274627
Platinum drug resistance	0.414232692
Porphyrin and chlorophyll metabolism	0.050132904
Primary bile acid biosynthesis	-0.254543756
Prion diseases	0.323608140
Progesterone-mediated oocyte maturation	0.236039384
Prolactin signaling pathway	0.358025043
Propanoate metabolism	0.348257714
Prostate cancer	0.516723098
Protein processing in endoplasmic reticulum	0.430030465
Proximal tubule bicarbonate reclamation	0.258704701
Pyrimidine metabolism	1.158622978
Pyruvate metabolism	0.590466821
Regulation of lipolysis in adipocytes	0.264076695
Renal cell carcinoma	0.437916444
Renin secretion	0.241940487
Renin-angiotensin system	0.136524216
Retinol metabolism	-1.720149283
Retrograde endocannabinoid signaling	0.146264402
Rheumatoid arthritis	-0.144437421

Riboflavin metabolism	0.442844276
Ribosome biogenesis in eukaryotes	0.311702320
RIG-I-like receptor signaling pathway	0.281013162
RNA degradation	0.698725445
RNA transport	0.405807361
Salivary secretion	0.079709780
Salmonella infection	0.418288373
Selenocompound metabolism	0.421827935
Serotonergic synapse	-0.009319493
Shigellosis	0.367224136
Signaling pathways regulating pluripotency of stem cells	0.382430786
Small cell lung cancer	0.600972518
SNARE interactions in vesicular transport	0.418854793
Sphingolipid metabolism	0.889425091
Sphingolipid signaling pathway	0.463713398
Staphylococcus aureus infection	-0.104226318
Starch and sucrose metabolism	0.403113336
Steroid biosynthesis	0.416858491
Steroid hormone biosynthesis	-0.918017005
Sulfur metabolism	0.510342385
Sulfur relay system	0.291488620
Synaptic vesicle cycle	0.593252789
Synthesis and degradation of ketone bodies	0.196432326
Systemic lupus erythematosus	-0.240751387
T cell receptor signaling pathway	0.200804244
Taste transduction	-0.354110403
Taurine and hypotaurine metabolism	-0.256318164
Terpenoid backbone biosynthesis	0.377632744
TGF-beta signaling pathway	0.246720711
Th1 and Th2 cell differentiation	-0.060579423
Th17 cell differentiation	0.138049595
Thiamine metabolism	0.176174831
Thyroid cancer	0.379727607
Thyroid hormone signaling pathway	0.644998969
Thyroid hormone synthesis	0.015996804
Tight junction	0.031391205
TNF signaling pathway	0.309377549
Toll-like receptor signaling pathway	0.092429185
Toxoplasmosis	0.267636297
Transcriptional misregulation in cancer	0.094880815
Tryptophan metabolism	-0.261552488
Type I diabetes mellitus	-0.394355578
Type II diabetes mellitus	0.214685321
Tyrosine metabolism	-0.308587125
Ubiquinone and other terpenoid-quinone biosynthesis	0.290190878
Valine, leucine and isoleucine degradation	0.570086945

Vascular smooth muscle contraction	0.205450142
Vasopressin-regulated water reabsorption	0.050239735
VEGF signaling pathway	0.322069084
Vibrio cholerae infection	0.403238330
Viral carcinogenesis	0.332183521
Viral myocarditis	0.162190959
Vitamin B6 metabolism	0.166115349
Vitamin digestion and absorption	-0.443345504
Wnt signaling pathway	0.274704522
	sample.N
Acute myeloid leukemia	4
Adherens junction	4
Adipocytokine signaling pathway	4
Adrenergic signaling in cardiomyocytes	4
African trypanosomiasis	4
AGE-RAGE signaling pathway in diabetic complications	4
Alanine, aspartate and glutamate metabolism	4
Aldosterone synthesis and secretion	4
Aldosterone-regulated sodium reabsorption	4
Allograft rejection	4
alpha-Linolenic acid metabolism	4
Alzheimer's disease	4
Amino sugar and nucleotide sugar metabolism	4
Aminoacyl-tRNA biosynthesis	4
Amoebiasis	4
Amphetamine addiction	4
AMPK signaling pathway	4
Amyotrophic lateral sclerosis (ALS)	4
Antifolate resistance	4
Antigen processing and presentation	4
Apelin signaling pathway	4
Apoptosis	4
Arachidonic acid metabolism	4
Arginine and proline metabolism	4
Arginine biosynthesis	4
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	4
Ascorbate and aldarate metabolism	4
Asthma	4
Autoimmune thyroid disease	4
Autophagy - animal	4
Autophagy - other	4
B cell receptor signaling pathway	4
Bacterial invasion of epithelial cells	4
Basal cell carcinoma	4
beta-Alanine metabolism	4
Bile secretion	4

Biosynthesis of unsaturated fatty acids	4
Biotin metabolism	4
Bladder cancer	4
Breast cancer	4
Butanoate metabolism	4
Caffeine metabolism	4
Carbohydrate digestion and absorption	4
Cardiac muscle contraction	4
Cell adhesion molecules (CAMs)	4
Cell cycle	4
Central carbon metabolism in cancer	4
Chagas disease (American trypanosomiasis)	4
Chemical carcinogenesis	4
Choline metabolism in cancer	4
Cholinergic synapse	4
Chronic myeloid leukemia	4
Circadian entrainment	4
Circadian rhythm	4
Citrate cycle (TCA cycle)	4
Cocaine addiction	4
Colorectal cancer	4
Complement and coagulation cascades	4
Cysteine and methionine metabolism	4
Cytosolic DNA-sensing pathway	4
D-Glutamine and D-glutamate metabolism	4
Dilated cardiomyopathy	4
Dopaminergic synapse	4
Dorso-ventral axis formation	4
Drug metabolism - cytochrome P450	4
Drug metabolism - other enzymes	4
ECM-receptor interaction	4
EGFR tyrosine kinase inhibitor resistance	4
Endocrine and other factor-regulated calcium reabsorption	4
Endocrine resistance	4
Endocytosis	4
Endometrial cancer	4
Epithelial cell signaling in Helicobacter pylori infection	4
Epstein-Barr virus infection	4
ErbB signaling pathway	4
Estrogen signaling pathway	4
Ether lipid metabolism	4
Fanconi anemia pathway	4
Fat digestion and absorption	4
Fatty acid biosynthesis	4
Fatty acid degradation	4
Fatty acid elongation	4

Fc epsilon RI signaling pathway	4
Fc gamma R-mediated phagocytosis	4
Ferroptosis	4
Fluid shear stress and atherosclerosis	4
Folate biosynthesis	4
FoxO signaling pathway	4
Fructose and mannose metabolism	4
GABAergic synapse	4
Galactose metabolism	4
Gap junction	4
Gastric acid secretion	4
Glioma	4
Glucagon signaling pathway	4
Glutamatergic synapse	4
Glutathione metabolism	4
Glycerolipid metabolism	4
Glycerophospholipid metabolism	4
Glycine, serine and threonine metabolism	4
Glycolysis / Gluconeogenesis	4
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	4
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	4
Glycosaminoglycan degradation	4
Glycosphingolipid biosynthesis - ganglio series	4
Glycosphingolipid biosynthesis - globo and isoglobo series	4
Glycosphingolipid biosynthesis - lacto and neolacto series	4
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	4
Glyoxylate and dicarboxylate metabolism	4
GnRH signaling pathway	4
Graft-versus-host disease	4
Hedgehog signaling pathway	4
Hepatitis B	4
Hepatitis C	4
Herpes simplex infection	4
HIF-1 signaling pathway	4
Hippo signaling pathway -multiple species	4
Histidine metabolism	4
Homologous recombination	4
Huntington's disease	4
Hypertrophic cardiomyopathy (HCM)	4
IL-17 signaling pathway	4
Inflammatory bowel disease (IBD)	4
Inflammatory mediator regulation of TRP channels	4
Influenza A	4
Inositol phosphate metabolism	4
Insulin resistance	4
Insulin secretion	4

Insulin signaling pathway	4
Intestinal immune network for IgA production	4
Legionellosis	4
Leishmaniasis	4
Leukocyte transendothelial migration	4
Linoleic acid metabolism	4
Lipoic acid metabolism	4
Long-term depression	4
Long-term potentiation	4
Longevity regulating pathway	4
Longevity regulating pathway - multiple species	4
Lysine biosynthesis	4
Lysine degradation	4
Malaria	4
Mannose type O-glycan biosynthesis	4
Maturity onset diabetes of the young	4
Measles	4
Melanogenesis	4
Melanoma	4
Metabolism of xenobiotics by cytochrome P450	4
Mineral absorption	4
Mitophagy - animal	4
Morphine addiction	4
mRNA surveillance pathway	4
mTOR signaling pathway	4
Mucin type O-glycan biosynthesis	4
N-Glycan biosynthesis	4
Natural killer cell mediated cytotoxicity	4
Neuroactive ligand-receptor interaction	4
Neurotrophin signaling pathway	4
NF-kappa B signaling pathway	4
Nicotinate and nicotinamide metabolism	4
Nitrogen metabolism	4
NOD-like receptor signaling pathway	4
Non-alcoholic fatty liver disease (NAFLD)	4
Non-small cell lung cancer	4
Notch signaling pathway	4
One carbon pool by folate	4
Oocyte meiosis	4
Osteoclast differentiation	4
Ovarian steroidogenesis	4
Oxidative phosphorylation	4
p53 signaling pathway	4
Pancreatic cancer	4
Pancreatic secretion	4
Pantothenate and CoA biosynthesis	4

Parkinson's disease	4
Pathogenic Escherichia coli infection	4
Pentose and glucuronate interconversions	4
Pentose phosphate pathway	4
Peroxisome	4
Pertussis	4
Phagosome	4
Phenylalanine metabolism	4
Phenylalanine, tyrosine and tryptophan biosynthesis	4
Phosphatidylinositol signaling system	4
Phospholipase D signaling pathway	4
Phosphonate and phosphinate metabolism	4
Phototransduction	4
Platelet activation	4
Platinum drug resistance	4
Porphyrin and chlorophyll metabolism	4
Primary bile acid biosynthesis	4
Prion diseases	4
Progesterone-mediated oocyte maturation	4
Prolactin signaling pathway	4
Propanoate metabolism	4
Prostate cancer	4
Protein processing in endoplasmic reticulum	4
Proximal tubule bicarbonate reclamation	4
Pyrimidine metabolism	4
Pyruvate metabolism	4
Regulation of lipolysis in adipocytes	4
Renal cell carcinoma	4
Renin secretion	4
Renin-angiotensin system	4
Retinol metabolism	4
Retrograde endocannabinoid signaling	4
Rheumatoid arthritis	4
Riboflavin metabolism	4
Ribosome biogenesis in eukaryotes	4
RIG-I-like receptor signaling pathway	4
RNA degradation	4
RNA transport	4
Salivary secretion	4
Salmonella infection	4
Selenocompound metabolism	4
Serotonergic synapse	4
Shigellosis	4
Signaling pathways regulating pluripotency of stem cells	4
Small cell lung cancer	4
SNARE interactions in vesicular transport	4

Sphingolipid metabolism	4
Sphingolipid signaling pathway	4
Staphylococcus aureus infection	4
Starch and sucrose metabolism	4
Steroid biosynthesis	4
Steroid hormone biosynthesis	4
Sulfur metabolism	4
Sulfur relay system	4
Synaptic vesicle cycle	4
Synthesis and degradation of ketone bodies	4
Systemic lupus erythematosus	4
T cell receptor signaling pathway	4
Taste transduction	4
Taurine and hypotaurine metabolism	4
Terpenoid backbone biosynthesis	4
TGF-beta signaling pathway	4
Th1 and Th2 cell differentiation	4
Th17 cell differentiation	4
Thiamine metabolism	4
Thyroid cancer	4
Thyroid hormone signaling pathway	4
Thyroid hormone synthesis	4
Tight junction	4
TNF signaling pathway	4
Toll-like receptor signaling pathway	4
Toxoplasmosis	4
Transcriptional misregulation in cancer	4
Tryptophan metabolism	4
Type I diabetes mellitus	4
Type II diabetes mellitus	4
Tyrosine metabolism	4
Ubiquinone and other terpenoid-quinone biosynthesis	4
Valine, leucine and isoleucine degradation	4
Vascular smooth muscle contraction	4
Vasopressin-regulated water reabsorption	4
VEGF signaling pathway	4
Vibrio cholerae infection	4
Viral carcinogenesis	4
Viral myocarditis	4
Vitamin B6 metabolism	4
Vitamin digestion and absorption	4
Wnt signaling pathway	4

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Acute myeloid leukemia	0.418218252
Adherens junction	0.558499010
Adipocytokine signaling pathway	0.199504712

Adrenergic signaling in cardiomyocytes	-0.433789468
African trypanosomiasis	-0.254089736
AGE-RAGE signaling pathway in diabetic complications	0.248203251
Alanine, aspartate and glutamate metabolism	0.546201789
Aldosterone synthesis and secretion	0.146549492
Aldosterone-regulated sodium reabsorption	0.120129219
Allograft rejection	-0.184138864
alpha-Linolenic acid metabolism	0.011021018
Alzheimer's disease	0.301787355
Amino sugar and nucleotide sugar metabolism	0.373819333
Aminoacyl-tRNA biosynthesis	0.226792583
Amoebiasis	-0.078140854
Amphetamine addiction	-0.073194761
AMPK signaling pathway	0.460630305
Amyotrophic lateral sclerosis (ALS)	0.172700466
Antifolate resistance	0.011303948
Antigen processing and presentation	-0.166588799
Apelin signaling pathway	0.268648054
Apoptosis	0.315906187
Arachidonic acid metabolism	-0.911778409
Arginine and proline metabolism	-0.093048717
Arginine biosynthesis	0.189601805
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.248712265
Ascorbate and aldarate metabolism	-0.616088723
Asthma	-0.381878293
Autoimmune thyroid disease	-0.411459759
Autophagy - animal	0.487237618
Autophagy - other	0.651095523
B cell receptor signaling pathway	0.116717073
Bacterial invasion of epithelial cells	0.457972067
Basal cell carcinoma	0.035241968
beta-Alanine metabolism	-0.262100367
Bile secretion	-0.055044491
Biosynthesis of unsaturated fatty acids	0.089275529
Biotin metabolism	0.246395574
Bladder cancer	0.422975557
Breast cancer	0.268750395
Butanoate metabolism	0.139825561
Caffeine metabolism	-0.420249407
Carbohydrate digestion and absorption	0.011087802
Cardiac muscle contraction	-0.221984490
Cell adhesion molecules (CAMs)	-0.241661275
Cell cycle	0.916299752
Central carbon metabolism in cancer	0.515207472
Chagas disease (American trypanosomiasis)	0.288927833
Chemical carcinogenesis	-0.885073651

Choline metabolism in cancer	0.308992538
Cholinergic synapse	0.088963594
Chronic myeloid leukemia	0.550041152
Circadian entrainment	-0.060989831
Circadian rhythm	0.512718640
Citrate cycle (TCA cycle)	0.913582382
Cocaine addiction	-0.051549620
Colorectal cancer	0.383638612
Complement and coagulation cascades	-0.262963178
Cysteine and methionine metabolism	0.459500680
Cytosolic DNA-sensing pathway	0.208784145
D-Glutamine and D-glutamate metabolism	0.326209954
Dilated cardiomyopathy	0.067048088
Dopaminergic synapse	-0.001926284
Dorso-ventral axis formation	0.260454553
Drug metabolism - cytochrome P450	-0.478747255
Drug metabolism - other enzymes	0.030643630
ECM-receptor interaction	0.205812121
EGFR tyrosine kinase inhibitor resistance	0.373061265
Endocrine and other factor-regulated calcium reabsorption	-0.175177026
Endocrine resistance	0.384921794
Endocytosis	0.605560945
Endometrial cancer	0.483989829
Epithelial cell signaling in Helicobacter pylori infection	0.163431248
Epstein-Barr virus infection	0.357535714
ErbB signaling pathway	0.323698864
Estrogen signaling pathway	0.124788587
Ether lipid metabolism	0.039849306
Fanconi anemia pathway	0.554765905
Fat digestion and absorption	0.292389655
Fatty acid biosynthesis	0.350697862
Fatty acid degradation	0.538652812
Fatty acid elongation	0.275901428
Fc epsilon RI signaling pathway	0.207404081
Fc gamma R-mediated phagocytosis	0.341806856
Ferroptosis	0.277036526
Fluid shear stress and atherosclerosis	0.294184837
Folate biosynthesis	0.257470413
FoxO signaling pathway	0.308730338
Fructose and mannose metabolism	0.376719140
GABAergic synapse	-0.539160792
Galactose metabolism	0.361858039
Gap junction	0.118528815
Gastric acid secretion	0.152041054
Glioma	0.372130585
Glucagon signaling pathway	0.336750648

Glutamatergic synapse	-0.233614324
Glutathione metabolism	0.268217301
Glycerolipid metabolism	0.559525854
Glycerophospholipid metabolism	0.654678327
Glycine, serine and threonine metabolism	-0.154545062
Glycolysis / Gluconeogenesis	0.472412321
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.397453822
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.301930748
Glycosaminoglycan degradation	0.344102316
Glycosphingolipid biosynthesis - ganglio series	0.242991930
Glycosphingolipid biosynthesis - globo and isoglobo series	-0.097470443
Glycosphingolipid biosynthesis - lacto and neolacto series	-0.573429561
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.404638478
Glyoxylate and dicarboxylate metabolism	0.201892905
GnRH signaling pathway	0.268762432
Graft-versus-host disease	-0.327538561
Hedgehog signaling pathway	0.160497858
Hepatitis B	0.304048062
Hepatitis C	0.397827768
Herpes simplex infection	0.307639808
HIF-1 signaling pathway	0.512004430
Hippo signaling pathway -multiple species	0.368798537
Histidine metabolism	-0.353112010
Homologous recombination	0.213429099
Huntington's disease	0.779905085
Hypertrophic cardiomyopathy (HCM)	0.194075275
IL-17 signaling pathway	0.198226140
Inflammatory bowel disease (IBD)	-0.182641955
Inflammatory mediator regulation of TRP channels	0.095898839
Influenza A	0.289958281
Inositol phosphate metabolism	0.949775276
Insulin resistance	0.337782018
Insulin secretion	-0.153315056
Insulin signaling pathway	0.432781579
Intestinal immune network for IgA production	-0.215673416
Legionellosis	-0.090736921
Leishmaniasis	-0.067106828
Leukocyte transendothelial migration	0.130495120
Linoleic acid metabolism	-1.230828059
Lipoic acid metabolism	-0.201982429
Long-term depression	0.146351297
Long-term potentiation	0.191937179
Longevity regulating pathway	0.583191467
Longevity regulating pathway - multiple species	0.530532759
Lysine biosynthesis	-0.103429276
Lysine degradation	0.630889912

Malaria	-0.285635048
Mannose type O-glycan biosynthesis	0.259574826
Maturity onset diabetes of the young	-0.206812438
Measles	0.178734107
Melanogenesis	0.102581916
Melanoma	0.243305696
Metabolism of xenobiotics by cytochrome P450	-1.255313787
Mineral absorption	-0.057189495
Mitophagy - animal	0.308928690
Morphine addiction	-0.442147753
mRNA surveillance pathway	0.613381856
mTOR signaling pathway	0.416139411
Mucin type O-glycan biosynthesis	-0.530869645
N-Glycan biosynthesis	0.570696810
Natural killer cell mediated cytotoxicity	0.013505457
Neuroactive ligand-receptor interaction	-0.447540024
Neurotrophin signaling pathway	0.294953359
NF-kappa B signaling pathway	0.153143077
Nicotinate and nicotinamide metabolism	-0.159885634
Nitrogen metabolism	0.601730282
NOD-like receptor signaling pathway	0.116159113
Non-alcoholic fatty liver disease (NAFLD)	0.184761507
Non-small cell lung cancer	0.448169221
Notch signaling pathway	0.203860982
One carbon pool by folate	0.877693169
Oocyte meiosis	0.620662248
Osteoclast differentiation	0.112808830
Ovarian steroidogenesis	-0.028141387
Oxidative phosphorylation	0.465592095
p53 signaling pathway	0.315695148
Pancreatic cancer	0.455178526
Pancreatic secretion	0.021749908
Pantothenate and CoA biosynthesis	0.103242084
Parkinson's disease	0.143646379
Pathogenic Escherichia coli infection	0.256558149
Pentose and glucuronate interconversions	-0.326577029
Pentose phosphate pathway	0.069202416
Peroxisome	0.110381204
Pertussis	0.047408743
Phagosome	0.935284139
Phenylalanine metabolism	-0.120514005
Phenylalanine, tyrosine and tryptophan biosynthesis	0.331821331
Phosphatidylinositol signaling system	1.081858708
Phospholipase D signaling pathway	0.247557367
Phosphonate and phosphinate metabolism	0.124457599
Phototransduction	-0.507216076

Platelet activation	0.236629276
Platinum drug resistance	0.380135583
Porphyrin and chlorophyll metabolism	0.006511851
Primary bile acid biosynthesis	-0.306553918
Prion diseases	0.301659329
Progesterone-mediated oocyte maturation	0.201361322
Prolactin signaling pathway	0.325706844
Propanoate metabolism	0.318589576
Prostate cancer	0.434358252
Protein processing in endoplasmic reticulum	0.403173389
Proximal tubule bicarbonate reclamation	0.166522111
Pyrimidine metabolism	1.109123231
Pyruvate metabolism	0.422814608
Regulation of lipolysis in adipocytes	0.196212804
Renal cell carcinoma	0.372244658
Renin secretion	0.176518818
Renin-angiotensin system	-0.205472446
Retinol metabolism	-1.870963944
Retrograde endocannabinoid signaling	0.035328709
Rheumatoid arthritis	-0.207025739
Riboflavin metabolism	0.235940062
Ribosome biogenesis in eukaryotes	0.306575419
RIG-I-like receptor signaling pathway	0.252102466
RNA degradation	0.732851198
RNA transport	0.434840224
Salivary secretion	0.035803883
Salmonella infection	0.387475136
Selenocompound metabolism	0.325921697
Serotonergic synapse	-0.168343411
Shigellosis	0.338395716
Signaling pathways regulating pluripotency of stem cells	0.270269720
Small cell lung cancer	0.549083227
SNARE interactions in vesicular transport	0.362699804
Sphingolipid metabolism	0.634139665
Sphingolipid signaling pathway	0.363681331
Staphylococcus aureus infection	-0.241705629
Starch and sucrose metabolism	0.271282941
Steroid biosynthesis	0.350978728
Steroid hormone biosynthesis	-1.284506504
Sulfur metabolism	0.506389722
Sulfur relay system	0.232607279
Synaptic vesicle cycle	0.558008311
Synthesis and degradation of ketone bodies	0.062039932
Systemic lupus erythematosus	-0.333970770
T cell receptor signaling pathway	0.171504291
Taste transduction	-0.333809424

Taurine and hypotaurine metabolism	-0.358041367
Terpenoid backbone biosynthesis	0.353514729
TGF-beta signaling pathway	0.192120721
Th1 and Th2 cell differentiation	-0.125139308
Th17 cell differentiation	0.090113407
Thiamine metabolism	0.108169391
Thyroid cancer	0.319948777
Thyroid hormone signaling pathway	0.575161332
Thyroid hormone synthesis	-0.066996364
Tight junction	0.045596540
TNF signaling pathway	0.282420712
Toll-like receptor signaling pathway	0.087525312
Toxoplasmosis	0.245673987
Transcriptional misregulation in cancer	0.086472602
Tryptophan metabolism	-0.298732814
Type I diabetes mellitus	-0.421467390
Type II diabetes mellitus	0.142120222
Tyrosine metabolism	-0.386120892
Ubiquinone and other terpenoid-quinone biosynthesis	0.271759012
Valine, leucine and isoleucine degradation	0.466294618
Vascular smooth muscle contraction	0.128921993
Vasopressin-regulated water reabsorption	-0.064548349
VEGF signaling pathway	0.246121778
Vibrio cholerae infection	0.366522289
Viral carcinogenesis	0.337526748
Viral myocarditis	0.131970317
Vitamin B6 metabolism	0.002633411
Vitamin digestion and absorption	-0.449476070
Wnt signaling pathway	0.121530245
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Acute myeloid leukemia	0.430986605
Adherens junction	0.571202645
Adipocytokine signaling pathway	0.208923306
Adrenergic signaling in cardiomyocytes	-0.358893777
African trypanosomiasis	-0.246430957
AGE-RAGE signaling pathway in diabetic complications	0.264122398
Alanine, aspartate and glutamate metabolism	0.561647627
Aldosterone synthesis and secretion	0.167659974
Aldosterone-regulated sodium reabsorption	0.125380755
Allograft rejection	-0.170561434
alpha-Linolenic acid metabolism	0.012794054
Alzheimer's disease	0.305084484
Amino sugar and nucleotide sugar metabolism	0.413056390
Aminoacyl-tRNA biosynthesis	0.269019203
Amoebiasis	-0.077627298
Amphetamine addiction	-0.070792934

AMPK signaling pathway	0.460668383
Amyotrophic lateral sclerosis (ALS)	0.181899984
Antifolate resistance	0.022592013
Antigen processing and presentation	-0.149027299
Apelin signaling pathway	0.279735521
Apoptosis	0.324801680
Arachidonic acid metabolism	-0.896020057
Arginine and proline metabolism	-0.059434847
Arginine biosynthesis	0.241625722
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.311304736
Ascorbate and aldarate metabolism	-0.569584069
Asthma	-0.374071196
Autoimmune thyroid disease	-0.406303456
Autophagy - animal	0.493683849
Autophagy - other	0.655348631
B cell receptor signaling pathway	0.135218439
Bacterial invasion of epithelial cells	0.463108931
Basal cell carcinoma	0.041873305
beta-Alanine metabolism	-0.249614927
Bile secretion	-0.049292851
Biosynthesis of unsaturated fatty acids	0.106337509
Biotin metabolism	0.250712021
Bladder cancer	0.435598940
Breast cancer	0.289144825
Butanoate metabolism	0.161960166
Caffeine metabolism	-0.400721318
Carbohydrate digestion and absorption	0.038258637
Cardiac muscle contraction	-0.201558705
Cell adhesion molecules (CAMs)	-0.238477237
Cell cycle	0.928873468
Central carbon metabolism in cancer	0.521020362
Chagas disease (American trypanosomiasis)	0.290182802
Chemical carcinogenesis	-0.878223915
Choline metabolism in cancer	0.310656711
Cholinergic synapse	0.092079601
Chronic myeloid leukemia	0.551037914
Circadian entrainment	-0.051139366
Circadian rhythm	0.515266236
Citrate cycle (TCA cycle)	0.916867809
Cocaine addiction	-0.003670011
Colorectal cancer	0.395365601
Complement and coagulation cascades	-0.256357025
Cysteine and methionine metabolism	0.499202364
Cytosolic DNA-sensing pathway	0.220103789
D-Glutamine and D-glutamate metabolism	0.332856639
Dilated cardiomyopathy	0.086114143

Dopaminergic synapse	0.032439773
Dorso-ventral axis formation	0.264959327
Drug metabolism - cytochrome P450	-0.475997600
Drug metabolism - other enzymes	0.067980258
ECM-receptor interaction	0.218378446
EGFR tyrosine kinase inhibitor resistance	0.374781862
Endocrine and other factor-regulated calcium reabsorption	-0.119570269
Endocrine resistance	0.409295728
Endocytosis	0.622305800
Endometrial cancer	0.494391573
Epithelial cell signaling in Helicobacter pylori infection	0.165557622
Epstein-Barr virus infection	0.366129535
ErbB signaling pathway	0.327908523
Estrogen signaling pathway	0.160881735
Ether lipid metabolism	0.055585182
Fanconi anemia pathway	0.638840217
Fat digestion and absorption	0.311549830
Fatty acid biosynthesis	0.352831642
Fatty acid degradation	0.550931431
Fatty acid elongation	0.279363568
Fc epsilon RI signaling pathway	0.214411887
Fc gamma R-mediated phagocytosis	0.348728399
Ferroptosis	0.284043775
Fluid shear stress and atherosclerosis	0.300149591
Folate biosynthesis	0.257718345
FoxO signaling pathway	0.309481726
Fructose and mannose metabolism	0.425368665
GABAergic synapse	-0.483393442
Galactose metabolism	0.362883311
Gap junction	0.122564409
Gastric acid secretion	0.166309774
Glioma	0.376389354
Glucagon signaling pathway	0.374447544
Glutamatergic synapse	-0.176418375
Glutathione metabolism	0.274362534
Glycerolipid metabolism	0.594370769
Glycerophospholipid metabolism	0.693210414
Glycine, serine and threonine metabolism	-0.092167648
Glycolysis / Gluconeogenesis	0.508743407
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.408325622
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.357492704
Glycosaminoglycan degradation	0.348733374
Glycosphingolipid biosynthesis - ganglio series	0.252342120
Glycosphingolipid biosynthesis - globo and isoglobo series	-0.090761116
Glycosphingolipid biosynthesis - lacto and neolacto series	-0.500367534
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.409422830

Glyoxylate and dicarboxylate metabolism	0.231600739
GnRH signaling pathway	0.285054794
Graft-versus-host disease	-0.323728813
Hedgehog signaling pathway	0.181288972
Hepatitis B	0.309954168
Hepatitis C	0.402691627
Herpes simplex infection	0.307975054
HIF-1 signaling pathway	0.516806000
Hippo signaling pathway -multiple species	0.371119744
Histidine metabolism	-0.344357556
Homologous recombination	0.222926196
Huntington's disease	0.787733968
Hypertrophic cardiomyopathy (HCM)	0.201169659
IL-17 signaling pathway	0.207517251
Inflammatory bowel disease (IBD)	-0.176227911
Inflammatory mediator regulation of TRP channels	0.122447643
Influenza A	0.293654580
Inositol phosphate metabolism	1.011435369
Insulin resistance	0.342979842
Insulin secretion	-0.127509660
Insulin signaling pathway	0.441693126
Intestinal immune network for IgA production	-0.202156907
Legionellosis	-0.086796762
Leishmaniasis	-0.061471437
Leukocyte transendothelial migration	0.142031861
Linoleic acid metabolism	-1.230263085
Lipoic acid metabolism	-0.150840326
Long-term depression	0.165360780
Long-term potentiation	0.227622358
Longevity regulating pathway	0.617209845
Longevity regulating pathway - multiple species	0.579074467
Lysine biosynthesis	-0.102472898
Lysine degradation	0.640651785
Malaria	-0.197868825
Mannose type O-glycan biosynthesis	0.272567740
Maturity onset diabetes of the young	-0.195614551
Measles	0.180605666
Melanogenesis	0.111653665
Melanoma	0.283802273
Metabolism of xenobiotics by cytochrome P450	-1.190740385
Mineral absorption	-0.049134811
Mitophagy - animal	0.315906349
Morphine addiction	-0.341061763
mRNA surveillance pathway	0.614866103
mTOR signaling pathway	0.429450779
Mucin type O-glycan biosynthesis	-0.504685537

N-Glycan biosynthesis	0.577893641
Natural killer cell mediated cytotoxicity	0.018165812
Neuroactive ligand-receptor interaction	-0.445376923
Neurotrophin signaling pathway	0.304880249
NF-kappa B signaling pathway	0.161925472
Nicotinate and nicotinamide metabolism	-0.106782607
Nitrogen metabolism	0.606413958
NOD-like receptor signaling pathway	0.118812333
Non-alcoholic fatty liver disease (NAFLD)	0.202911932
Non-small cell lung cancer	0.459856031
Notch signaling pathway	0.356086119
One carbon pool by folate	0.956951496
Oocyte meiosis	0.623883108
Osteoclast differentiation	0.118539772
Ovarian steroidogenesis	-0.012848592
Oxidative phosphorylation	0.475943344
p53 signaling pathway	0.331373553
Pancreatic cancer	0.476396889
Pancreatic secretion	0.029963092
Pantothenate and CoA biosynthesis	0.108809773
Parkinson's disease	0.195797150
Pathogenic Escherichia coli infection	0.268210924
Pentose and glucuronate interconversions	-0.303469078
Pentose phosphate pathway	0.100634562
Peroxisome	0.122587236
Pertussis	0.078290738
Phagosome	1.082278491
Phenylalanine metabolism	-0.118550154
Phenylalanine, tyrosine and tryptophan biosynthesis	0.337927497
Phosphatidylinositol signaling system	1.259241040
Phospholipase D signaling pathway	0.269738226
Phosphonate and phosphinate metabolism	0.131107109
Phototransduction	-0.452581272
Platelet activation	0.253427276
Platinum drug resistance	0.411819548
Porphyrin and chlorophyll metabolism	0.022002906
Primary bile acid biosynthesis	-0.284079747
Prion diseases	0.302361208
Progesterone-mediated oocyte maturation	0.233239107
Prolactin signaling pathway	0.333611156
Propanoate metabolism	0.338474498
Prostate cancer	0.466124250
Protein processing in endoplasmic reticulum	0.405563292
Proximal tubule bicarbonate reclamation	0.169278215
Pyrimidine metabolism	1.143112292
Pyruvate metabolism	0.436517911

Regulation of lipolysis in adipocytes	0.203092314
Renal cell carcinoma	0.393741845
Renin secretion	0.212165135
Renin-angiotensin system	-0.163134793
Retinol metabolism	-1.833717263
Retrograde endocannabinoid signaling	0.054605228
Rheumatoid arthritis	-0.171292778
Riboflavin metabolism	0.236311858
Ribosome biogenesis in eukaryotes	0.316765067
RIG-I-like receptor signaling pathway	0.261378728
RNA degradation	0.734421092
RNA transport	0.437735115
Salivary secretion	0.054815994
Salmonella infection	0.392005533
Selenocompound metabolism	0.328381168
Serotonergic synapse	-0.148418695
Shigellosis	0.342210081
Signaling pathways regulating pluripotency of stem cells	0.285514885
Small cell lung cancer	0.571853492
SNARE interactions in vesicular transport	0.366131363
Sphingolipid metabolism	0.645662125
Sphingolipid signaling pathway	0.390876386
Staphylococcus aureus infection	-0.191548354
Starch and sucrose metabolism	0.297650614
Steroid biosynthesis	0.356319560
Steroid hormone biosynthesis	-1.267741822
Sulfur metabolism	0.506936790
Sulfur relay system	0.253495243
Synaptic vesicle cycle	0.565776527
Synthesis and degradation of ketone bodies	0.095968679
Systemic lupus erythematosus	-0.326584276
T cell receptor signaling pathway	0.173618140
Taste transduction	-0.309402412
Taurine and hypotaurine metabolism	-0.336445132
Terpenoid backbone biosynthesis	0.371784168
TGF-beta signaling pathway	0.205369249
Th1 and Th2 cell differentiation	-0.071655950
Th17 cell differentiation	0.111401494
Thiamine metabolism	0.110995456
Thyroid cancer	0.325265894
Thyroid hormone signaling pathway	0.586067678
Thyroid hormone synthesis	-0.018003814
Tight junction	0.050786420
TNF signaling pathway	0.289639886
Toll-like receptor signaling pathway	0.097494666
Toxoplasmosis	0.250532828

Transcriptional misregulation in cancer	0.102155870
Tryptophan metabolism	-0.285161853
Type I diabetes mellitus	-0.418412233
Type II diabetes mellitus	0.162309338
Tyrosine metabolism	-0.379106101
Ubiquinone and other terpenoid-quinone biosynthesis	0.278278653
Valine, leucine and isoleucine degradation	0.520136498
Vascular smooth muscle contraction	0.148066662
Vasopressin-regulated water reabsorption	-0.063787423
VEGF signaling pathway	0.250311585
Vibrio cholerae infection	0.383010492
Viral carcinogenesis	0.344909229
Viral myocarditis	0.132012253
Vitamin B6 metabolism	0.036002338
Vitamin digestion and absorption	-0.437069393
Wnt signaling pathway	0.131194355
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Acute myeloid leukemia	0.437234896
Adherens junction	0.575840595
Adipocytokine signaling pathway	0.219441784
Adrenergic signaling in cardiomyocytes	-0.307045574
African trypanosomiasis	-0.211091909
AGE-RAGE signaling pathway in diabetic complications	0.277417525
Alanine, aspartate and glutamate metabolism	0.584827779
Aldosterone synthesis and secretion	0.175230485
Aldosterone-regulated sodium reabsorption	0.152735333
Allograft rejection	-0.163878616
alpha-Linolenic acid metabolism	0.023345677
Alzheimer's disease	0.308194874
Amino sugar and nucleotide sugar metabolism	0.431662282
Aminoacyl-tRNA biosynthesis	0.294188260
Amoebiasis	-0.069686783
Amphetamine addiction	-0.048603102
AMPK signaling pathway	0.466963913
Amyotrophic lateral sclerosis (ALS)	0.185831438
Antifolate resistance	0.039530860
Antigen processing and presentation	-0.127201604
Apelin signaling pathway	0.288573371
Apoptosis	0.333242877
Arachidonic acid metabolism	-0.853144072
Arginine and proline metabolism	-0.039157470
Arginine biosynthesis	0.268356437
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.337640105
Ascorbate and aldarate metabolism	-0.541783368
Asthma	-0.371313371
Autoimmune thyroid disease	-0.403466721

Autophagy - animal	0.498594411
Autophagy - other	0.663835709
B cell receptor signaling pathway	0.146056793
Bacterial invasion of epithelial cells	0.480410041
Basal cell carcinoma	0.046179519
beta-Alanine metabolism	-0.223768491
Bile secretion	-0.037732189
Biosynthesis of unsaturated fatty acids	0.122632154
Biotin metabolism	0.257338202
Bladder cancer	0.443887453
Breast cancer	0.297130530
Butanoate metabolism	0.170224733
Caffeine metabolism	-0.393777205
Carbohydrate digestion and absorption	0.065032237
Cardiac muscle contraction	-0.185568920
Cell adhesion molecules (CAMs)	-0.221652126
Cell cycle	0.949906138
Central carbon metabolism in cancer	0.523546976
Chagas disease (American trypanosomiasis)	0.297440280
Chemical carcinogenesis	-0.856694838
Choline metabolism in cancer	0.316427740
Cholinergic synapse	0.129505528
Chronic myeloid leukemia	0.562980041
Circadian entrainment	-0.043445176
Circadian rhythm	0.517326040
Citrate cycle (TCA cycle)	0.920730138
Cocaine addiction	0.020776259
Colorectal cancer	0.404820120
Complement and coagulation cascades	-0.241819095
Cysteine and methionine metabolism	0.521949178
Cytosolic DNA-sensing pathway	0.236179908
D-Glutamine and D-glutamate metabolism	0.343454577
Dilated cardiomyopathy	0.111021849
Dopaminergic synapse	0.048572384
Dorso-ventral axis formation	0.284493059
Drug metabolism - cytochrome P450	-0.473461518
Drug metabolism - other enzymes	0.081364620
ECM-receptor interaction	0.258709362
EGFR tyrosine kinase inhibitor resistance	0.429493237
Endocrine and other factor-regulated calcium reabsorption	-0.098620775
Endocrine resistance	0.420627404
Endocytosis	0.637529517
Endometrial cancer	0.511713471
Epithelial cell signaling in Helicobacter pylori infection	0.173539277
Epstein-Barr virus infection	0.369738917
ErbB signaling pathway	0.353995608

Estrogen signaling pathway	0.184138496
Ether lipid metabolism	0.094051386
Fanconi anemia pathway	0.681584583
Fat digestion and absorption	0.318406715
Fatty acid biosynthesis	0.363717372
Fatty acid degradation	0.571558190
Fatty acid elongation	0.292876810
Fc epsilon RI signaling pathway	0.224780536
Fc gamma R-mediated phagocytosis	0.351795326
Ferroptosis	0.287377753
Fluid shear stress and atherosclerosis	0.322875896
Folate biosynthesis	0.271901692
FoxO signaling pathway	0.310337563
Fructose and mannose metabolism	0.465549450
GABAergic synapse	-0.418044476
Galactose metabolism	0.366955648
Gap junction	0.129749630
Gastric acid secretion	0.187041921
Glioma	0.402182051
Glucagon signaling pathway	0.400068728
Glutamatergic synapse	-0.132705197
Glutathione metabolism	0.282057440
Glycerolipid metabolism	0.608547025
Glycerophospholipid metabolism	0.727799534
Glycine, serine and threonine metabolism	-0.042307928
Glycolysis / Gluconeogenesis	0.533042764
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.421621283
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.402467312
Glycosaminoglycan degradation	0.370741889
Glycosphingolipid biosynthesis - ganglio series	0.256747538
Glycosphingolipid biosynthesis - globo and isoglobo series	-0.087116754
Glycosphingolipid biosynthesis - lacto and neolacto series	-0.462896347
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.433087120
Glyoxylate and dicarboxylate metabolism	0.246546183
GnRH signaling pathway	0.293484366
Graft-versus-host disease	-0.311201156
Hedgehog signaling pathway	0.210988154
Hepatitis B	0.318324472
Hepatitis C	0.404516668
Herpes simplex infection	0.320528464
HIF-1 signaling pathway	0.523494648
Hippo signaling pathway -multiple species	0.376768848
Histidine metabolism	-0.339597719
Homologous recombination	0.232463483
Huntington's disease	0.800584779
Hypertrophic cardiomyopathy (HCM)	0.204387173

IL-17 signaling pathway	0.218521463
Inflammatory bowel disease (IBD)	-0.169519438
Inflammatory mediator regulation of TRP channels	0.134922230
Influenza A	0.309854020
Inositol phosphate metabolism	1.047718164
Insulin resistance	0.346728578
Insulin secretion	-0.112229647
Insulin signaling pathway	0.454086396
Intestinal immune network for IgA production	-0.197052700
Legionellosis	-0.083028083
Leishmaniasis	-0.052595647
Leukocyte transendothelial migration	0.147608401
Linoleic acid metabolism	-1.229038083
Lipoic acid metabolism	-0.110551316
Long-term depression	0.199970459
Long-term potentiation	0.254208262
Longevity regulating pathway	0.630022735
Longevity regulating pathway - multiple species	0.602246388
Lysine biosynthesis	-0.093206768
Lysine degradation	0.644845923
Malaria	-0.163801188
Mannose type O-glycan biosynthesis	0.295526587
Maturity onset diabetes of the young	-0.172417097
Measles	0.184005823
Melanogenesis	0.125047644
Melanoma	0.302313242
Metabolism of xenobiotics by cytochrome P450	-1.133317084
Mineral absorption	-0.032990400
Mitophagy - animal	0.321236416
Morphine addiction	-0.276950077
mRNA surveillance pathway	0.615489471
mTOR signaling pathway	0.442801705
Mucin type O-glycan biosynthesis	-0.455355278
N-Glycan biosynthesis	0.644469795
Natural killer cell mediated cytotoxicity	0.024953854
Neuroactive ligand-receptor interaction	-0.406908142
Neurotrophin signaling pathway	0.320090747
NF-kappa B signaling pathway	0.170518973
Nicotinate and nicotinamide metabolism	-0.077324865
Nitrogen metabolism	0.613540617
NOD-like receptor signaling pathway	0.124012033
Non-alcoholic fatty liver disease (NAFLD)	0.213164529
Non-small cell lung cancer	0.474108593
Notch signaling pathway	0.418355462
One carbon pool by folate	0.990710367
Oocyte meiosis	0.639110480

Osteoclast differentiation	0.120907191
Ovarian steroidogenesis	0.020725105
Oxidative phosphorylation	0.480849512
p53 signaling pathway	0.337264032
Pancreatic cancer	0.483966410
Pancreatic secretion	0.060698588
Pantothenate and CoA biosynthesis	0.111630867
Parkinson's disease	0.215089542
Pathogenic Escherichia coli infection	0.300988011
Pentose and glucuronate interconversions	-0.285143442
Pentose phosphate pathway	0.198634457
Peroxisome	0.128796457
Pertussis	0.089156927
Phagosome	1.158117909
Phenylalanine metabolism	-0.106326087
Phenylalanine, tyrosine and tryptophan biosynthesis	0.341635750
Phosphatidylinositol signaling system	1.326472505
Phospholipase D signaling pathway	0.303015715
Phosphonate and phosphinate metabolism	0.133837917
Phototransduction	-0.396779286
Platelet activation	0.264334672
Platinum drug resistance	0.423309883
Porphyrin and chlorophyll metabolism	0.034461596
Primary bile acid biosynthesis	-0.272535651
Prion diseases	0.310678875
Progesterone-mediated oocyte maturation	0.244234070
Prolactin signaling pathway	0.336695682
Propanoate metabolism	0.350107816
Prostate cancer	0.477579760
Protein processing in endoplasmic reticulum	0.421819311
Proximal tubule bicarbonate reclamation	0.176778180
Pyrimidine metabolism	1.159942962
Pyruvate metabolism	0.476943288
Regulation of lipolysis in adipocytes	0.208395973
Renal cell carcinoma	0.414581587
Renin secretion	0.224419602
Renin-angiotensin system	-0.136622964
Retinol metabolism	-1.814392979
Retrograde endocannabinoid signaling	0.087697721
Rheumatoid arthritis	-0.151090262
Riboflavin metabolism	0.249645514
Ribosome biogenesis in eukaryotes	0.326530118
RIG-I-like receptor signaling pathway	0.275013079
RNA degradation	0.734987551
RNA transport	0.440956715
Salivary secretion	0.061733508

Salmonella infection	0.416078558
Selenocompound metabolism	0.344070808
Serotonergic synapse	-0.137563137
Shigellosis	0.372494726
Signaling pathways regulating pluripotency of stem cells	0.314689350
Small cell lung cancer	0.604054709
SNARE interactions in vesicular transport	0.400841254
Sphingolipid metabolism	0.749981265
Sphingolipid signaling pathway	0.407885535
Staphylococcus aureus infection	-0.172821557
Starch and sucrose metabolism	0.309541957
Steroid biosynthesis	0.382485989
Steroid hormone biosynthesis	-1.182667576
Sulfur metabolism	0.523253909
Sulfur relay system	0.278077448
Synaptic vesicle cycle	0.580574051
Synthesis and degradation of ketone bodies	0.111812603
Systemic lupus erythematosus	-0.309697993
T cell receptor signaling pathway	0.180797016
Taste transduction	-0.299134970
Taurine and hypotaurine metabolism	-0.314787449
Terpenoid backbone biosynthesis	0.385771004
TGF-beta signaling pathway	0.222736351
Th1 and Th2 cell differentiation	-0.045568830
Th17 cell differentiation	0.123338390
Thiamine metabolism	0.114055340
Thyroid cancer	0.338299115
Thyroid hormone signaling pathway	0.606695726
Thyroid hormone synthesis	0.003465096
Tight junction	0.054043340
TNF signaling pathway	0.294135656
Toll-like receptor signaling pathway	0.103383361
Toxoplasmosis	0.253889838
Transcriptional misregulation in cancer	0.113216643
Tryptophan metabolism	-0.278931229
Type I diabetes mellitus	-0.405310622
Type II diabetes mellitus	0.173316665
Tyrosine metabolism	-0.352396341
Ubiquinone and other terpenoid-quinone biosynthesis	0.292802335
Valine, leucine and isoleucine degradation	0.547191719
Vascular smooth muscle contraction	0.165706628
Vasopressin-regulated water reabsorption	-0.043809167
VEGF signaling pathway	0.267583907
Vibrio cholerae infection	0.389069658
Viral carcinogenesis	0.349006408
Viral myocarditis	0.147432739

Vitamin B6 metabolism	0.053650234
Vitamin digestion and absorption	-0.425570903
Wnt signaling pathway	0.144664042
	sample.Mean
Acute myeloid leukemia	0.433426281
Adherens junction	0.572510420
Adipocytokine signaling pathway	0.217751447
Adrenergic signaling in cardiomyocytes	-0.325384810
African trypanosomiasis	-0.208553649
AGE-RAGE signaling pathway in diabetic complications	0.275361318
Alanine, aspartate and glutamate metabolism	0.580452831
Aldosterone synthesis and secretion	0.169017525
Aldosterone-regulated sodium reabsorption	0.152239602
Allograft rejection	-0.164988381
alpha-Linolenic acid metabolism	0.030853674
Alzheimer's disease	0.309093169
Amino sugar and nucleotide sugar metabolism	0.424250021
Aminoacyl-tRNA biosynthesis	0.283241749
Amoebiasis	-0.067973337
Amphetamine addiction	-0.049094381
AMPK signaling pathway	0.469370375
Amyotrophic lateral sclerosis (ALS)	0.187956574
Antifolate resistance	0.036061134
Antigen processing and presentation	-0.131736441
Apelin signaling pathway	0.298996616
Apoptosis	0.336055721
Arachidonic acid metabolism	-0.855032515
Arginine and proline metabolism	-0.046434459
Arginine biosynthesis	0.260209531
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.316977186
Ascorbate and aldarate metabolism	-0.557279974
Asthma	-0.373067852
Autoimmune thyroid disease	-0.393317800
Autophagy - animal	0.500751153
Autophagy - other	0.662599712
B cell receptor signaling pathway	0.140916068
Bacterial invasion of epithelial cells	0.478967234
Basal cell carcinoma	0.058907517
beta-Alanine metabolism	-0.209955251
Bile secretion	-0.028468555
Biosynthesis of unsaturated fatty acids	0.150140635
Biotin metabolism	0.258974543
Bladder cancer	0.447199256
Breast cancer	0.306641167
Butanoate metabolism	0.166127992
Caffeine metabolism	-0.390392147

Carbohydrate digestion and absorption	0.070842002
Cardiac muscle contraction	-0.192347548
Cell adhesion molecules (CAMs)	-0.220964765
Cell cycle	0.952630795
Central carbon metabolism in cancer	0.523407986
Chagas disease (American trypanosomiasis)	0.297937340
Chemical carcinogenesis	-0.851713962
Choline metabolism in cancer	0.316498000
Cholinergic synapse	0.131109697
Chronic myeloid leukemia	0.565386441
Circadian entrainment	-0.035989968
Circadian rhythm	0.519538560
Citrate cycle (TCA cycle)	0.920972576
Cocaine addiction	0.007940889
Colorectal cancer	0.403135301
Complement and coagulation cascades	-0.237520561
Cysteine and methionine metabolism	0.514094721
Cytosolic DNA-sensing pathway	0.234307025
D-Glutamine and D-glutamate metabolism	0.343621387
Dilated cardiomyopathy	0.119966578
Dopaminergic synapse	0.042510676
Dorso-ventral axis formation	0.283361708
Drug metabolism - cytochrome P450	-0.470951028
Drug metabolism - other enzymes	0.069816112
ECM-receptor interaction	0.291828319
EGFR tyrosine kinase inhibitor resistance	0.431844594
Endocrine and other factor-regulated calcium reabsorption	-0.112501302
Endocrine resistance	0.418705535
Endocytosis	0.632168468
Endometrial cancer	0.512066853
Epithelial cell signaling in Helicobacter pylori infection	0.175496941
Epstein-Barr virus infection	0.368443190
ErbB signaling pathway	0.354475253
Estrogen signaling pathway	0.175315906
Ether lipid metabolism	0.128798243
Fanconi anemia pathway	0.654963952
Fat digestion and absorption	0.316678147
Fatty acid biosynthesis	0.364589151
Fatty acid degradation	0.569056111
Fatty acid elongation	0.295115165
Fc epsilon RI signaling pathway	0.228877411
Fc gamma R-mediated phagocytosis	0.353901767
Ferroptosis	0.286748754
Fluid shear stress and atherosclerosis	0.323716699
Folate biosynthesis	0.273022907
FoxO signaling pathway	0.312343258

Fructose and mannose metabolism	0.460875536
GABAergic synapse	-0.429512976
Galactose metabolism	0.405374019
Gap junction	0.129108275
Gastric acid secretion	0.186196760
Glioma	0.402023258
Glucagon signaling pathway	0.393654342
Glutamatergic synapse	-0.150739061
Glutathione metabolism	0.290324563
Glycerolipid metabolism	0.620221779
Glycerophospholipid metabolism	0.755336931
Glycine, serine and threonine metabolism	-0.050355204
Glycolysis / Gluconeogenesis	0.534989334
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.423156896
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.385698777
Glycosaminoglycan degradation	0.370535891
Glycosphingolipid biosynthesis - ganglio series	0.255115503
Glycosphingolipid biosynthesis - globo and isoglobo series	-0.087583098
Glycosphingolipid biosynthesis - lacto and neolacto series	-0.466779460
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.437123731
Glyoxylate and dicarboxylate metabolism	0.236747941
GnRH signaling pathway	0.288338144
Graft-versus-host disease	-0.309472293
Hedgehog signaling pathway	0.206890550
Hepatitis B	0.319306582
Hepatitis C	0.407632854
Herpes simplex infection	0.323701862
HIF-1 signaling pathway	0.530138909
Hippo signaling pathway -multiple species	0.377378632
Histidine metabolism	-0.339108902
Homologous recombination	0.231287981
Huntington's disease	0.802831580
Hypertrophic cardiomyopathy (HCM)	0.205586015
IL-17 signaling pathway	0.217027421
Inflammatory bowel disease (IBD)	-0.170706381
Inflammatory mediator regulation of TRP channels	0.129285999
Influenza A	0.310755777
Inositol phosphate metabolism	1.031038282
Insulin resistance	0.351099333
Insulin secretion	-0.112831923
Insulin signaling pathway	0.451127940
Intestinal immune network for IgA production	-0.200231790
Legionellosis	-0.082326227
Leishmaniasis	-0.050738273
Leukocyte transendothelial migration	0.150155657
Linoleic acid metabolism	-1.218004149

Lipoic acid metabolism	-0.123914118
Long-term depression	0.195039337
Long-term potentiation	0.242933906
Longevity regulating pathway	0.619537635
Longevity regulating pathway - multiple species	0.590594288
Lysine biosynthesis	-0.053635355
Lysine degradation	0.644182302
Malaria	-0.177157679
Mannose type O-glycan biosynthesis	0.295190740
Maturity onset diabetes of the young	-0.175905081
Measles	0.185280619
Melanogenesis	0.128158992
Melanoma	0.334271427
Metabolism of xenobiotics by cytochrome P450	-1.154202490
Mineral absorption	-0.034032693
Mitophagy - animal	0.319216282
Morphine addiction	-0.288042848
mRNA surveillance pathway	0.616729097
mTOR signaling pathway	0.442014875
Mucin type O-glycan biosynthesis	-0.440183570
N-Glycan biosynthesis	0.645417104
Natural killer cell mediated cytotoxicity	0.029312399
Neuroactive ligand-receptor interaction	-0.407342579
Neurotrophin signaling pathway	0.319619510
NF-kappa B signaling pathway	0.172636195
Nicotinate and nicotinamide metabolism	-0.091343573
Nitrogen metabolism	0.612139123
NOD-like receptor signaling pathway	0.127213483
Non-alcoholic fatty liver disease (NAFLD)	0.214472578
Non-small cell lung cancer	0.472512446
Notch signaling pathway	0.374089237
One carbon pool by folate	0.971634692
Oocyte meiosis	0.647525664
Osteoclast differentiation	0.122026617
Ovarian steroidogenesis	0.025794450
Oxidative phosphorylation	0.478866730
p53 signaling pathway	0.335901433
Pancreatic cancer	0.480529972
Pancreatic secretion	0.073905365
Pantothenate and CoA biosynthesis	0.111510530
Parkinson's disease	0.202308077
Pathogenic Escherichia coli infection	0.297230374
Pentose and glucuronate interconversions	-0.285404554
Pentose phosphate pathway	0.228547336
Peroxisome	0.127172623
Pertussis	0.086337730

Phagosome	1.125775105
Phenylalanine metabolism	-0.104523173
Phenylalanine, tyrosine and tryptophan biosynthesis	0.340269247
Phosphatidylinositol signaling system	1.275845032
Phospholipase D signaling pathway	0.297333263
Phosphonate and phosphinate metabolism	0.132913672
Phototransduction	-0.408638235
Platelet activation	0.261524616
Platinum drug resistance	0.414920656
Porphyrin and chlorophyll metabolism	0.033332979
Primary bile acid biosynthesis	-0.275748332
Prion diseases	0.319546934
Progesterone-mediated oocyte maturation	0.234443962
Prolactin signaling pathway	0.336661369
Propanoate metabolism	0.349076789
Prostate cancer	0.467099435
Protein processing in endoplasmic reticulum	0.422212239
Proximal tubule bicarbonate reclamation	0.176121443
Pyrimidine metabolism	1.182038515
Pyruvate metabolism	0.478172959
Regulation of lipolysis in adipocytes	0.212396696
Renal cell carcinoma	0.413897540
Renin secretion	0.215604076
Renin-angiotensin system	-0.083319095
Retinol metabolism	-1.798928036
Retrograde endocannabinoid signaling	0.096272011
Rheumatoid arthritis	-0.159185601
Riboflavin metabolism	0.273571455
Ribosome biogenesis in eukaryotes	0.326854161
RIG-I-like receptor signaling pathway	0.274614621
RNA degradation	0.738029911
RNA transport	0.445879617
Salivary secretion	0.058375065
Salmonella infection	0.418433069
Selenocompound metabolism	0.349761815
Serotonergic synapse	-0.131842380
Shigellosis	0.379600214
Signaling pathways regulating pluripotency of stem cells	0.312993760
Small cell lung cancer	0.600632277
SNARE interactions in vesicular transport	0.400044130
Sphingolipid metabolism	0.771665412
Sphingolipid signaling pathway	0.404595580
Staphylococcus aureus infection	-0.177994664
Starch and sucrose metabolism	0.310864126
Steroid biosynthesis	0.392760548
Steroid hormone biosynthesis	-1.164670057

Sulfur metabolism	0.524333781
Sulfur relay system	0.277161716
Synaptic vesicle cycle	0.580578106
Synthesis and degradation of ketone bodies	0.109407453
Systemic lupus erythematosus	-0.302807754
T cell receptor signaling pathway	0.180483538
Taste transduction	-0.298117947
Taurine and hypotaurine metabolism	-0.320030727
Terpenoid backbone biosynthesis	0.381229149
TGF-beta signaling pathway	0.220691468
Th1 and Th2 cell differentiation	-0.052958459
Th17 cell differentiation	0.117118232
Thiamine metabolism	0.114546256
Thyroid cancer	0.339218571
Thyroid hormone signaling pathway	0.605335069
Thyroid hormone synthesis	-0.011984865
Tight junction	0.054088977
TNF signaling pathway	0.293158581
Toll-like receptor signaling pathway	0.103127022
Toxoplasmosis	0.253755191
Transcriptional misregulation in cancer	0.108270711
Tryptophan metabolism	-0.277455645
Type I diabetes mellitus	-0.394325087
Type II diabetes mellitus	0.169158928
Tyrosine metabolism	-0.344048735
Ubiquinone and other terpenoid-quinone biosynthesis	0.293508081
Valine, leucine and isoleucine degradation	0.533004830
Vascular smooth muscle contraction	0.160067196
Vasopressin-regulated water reabsorption	-0.017302392
VEGF signaling pathway	0.266984172
Vibrio cholerae infection	0.390799471
Viral carcinogenesis	0.350189482
Viral myocarditis	0.149874875
Vitamin B6 metabolism	0.062807292
Vitamin digestion and absorption	-0.426896100
Wnt signaling pathway	0.147646913
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Acute myeloid leukemia	0.4396745725
Adherens junction	0.5771483692
Adipocytokine signaling pathway	0.2282699249
Adrenergic signaling in cardiomyocytes	-0.2735366070
African trypanosomiasis	-0.1732146005
AGE-RAGE signaling pathway in diabetic complications	0.2886564445
Alanine, aspartate and glutamate metabolism	0.6036329828
Aldosterone synthesis and secretion	0.1765880369
Aldosterone-regulated sodium reabsorption	0.1795941796

Allograft rejection	-0.1583055628
alpha-Linolenic acid metabolism	0.0414052977
Alzheimer's disease	0.3122035589
Amino sugar and nucleotide sugar metabolism	0.4428559127
Aminoacyl-tRNA biosynthesis	0.3084108062
Amoebiasis	-0.0600328224
Amphetamine addiction	-0.0269045492
AMPK signaling pathway	0.4756659051
Amyotrophic lateral sclerosis (ALS)	0.1918880279
Antifolate resistance	0.0529999804
Antigen processing and presentation	-0.1099107465
Apelin signaling pathway	0.3078344657
Apoptosis	0.3444969178
Arachidonic acid metabolism	-0.8121565296
Arginine and proline metabolism	-0.0261570825
Arginine biosynthesis	0.2869402460
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.3433125554
Ascorbate and aldarate metabolism	-0.5294792733
Asthma	-0.3703100271
Autoimmune thyroid disease	-0.3904810641
Autophagy - animal	0.5056617151
Autophagy - other	0.6710867900
B cell receptor signaling pathway	0.1517544225
Bacterial invasion of epithelial cells	0.4962683441
Basal cell carcinoma	0.0632137299
beta-Alanine metabolism	-0.1841088151
Bile secretion	-0.0169078939
Biosynthesis of unsaturated fatty acids	0.1664352798
Biotin metabolism	0.2656007236
Bladder cancer	0.4554877694
Breast cancer	0.3146268725
Butanoate metabolism	0.1743925594
Caffeine metabolism	-0.3834480342
Carbohydrate digestion and absorption	0.0976156023
Cardiac muscle contraction	-0.1763577637
Cell adhesion molecules (CAMs)	-0.2041396541
Cell cycle	0.9736634645
Central carbon metabolism in cancer	0.5259345995
Chagas disease (American trypanosomiasis)	0.3051948179
Chemical carcinogenesis	-0.8301848847
Choline metabolism in cancer	0.3222690283
Cholinergic synapse	0.1685356245
Chronic myeloid leukemia	0.5773285678
Circadian entrainment	-0.0282957774
Circadian rhythm	0.5215983645
Citrate cycle (TCA cycle)	0.9248349050

Cocaine addiction	0.0323871591
Colorectal cancer	0.4125898204
Complement and coagulation cascades	-0.2229826319
Cysteine and methionine metabolism	0.5368415351
Cytosolic DNA-sensing pathway	0.2503831446
D-Glutamine and D-glutamate metabolism	0.3542193249
Dilated cardiomyopathy	0.1448742847
Dopaminergic synapse	0.0586432877
Dorso-ventral axis formation	0.3028954403
Drug metabolism - cytochrome P450	-0.4684149456
Drug metabolism - other enzymes	0.0832004735
ECM-receptor interaction	0.3321592347
EGFR tyrosine kinase inhibitor resistance	0.4865559690
Endocrine and other factor-regulated calcium reabsorption	-0.0915518077
Endocrine resistance	0.4300372101
Endocytosis	0.6473921854
Endometrial cancer	0.5293887513
Epithelial cell signaling in Helicobacter pylori infection	0.1834785961
Epstein-Barr virus infection	0.3720525714
ErbB signaling pathway	0.3805623382
Estrogen signaling pathway	0.1985726663
Ether lipid metabolism	0.1672644471
Fanconi anemia pathway	0.6977083176
Fat digestion and absorption	0.3235350325
Fatty acid biosynthesis	0.3754748812
Fatty acid degradation	0.5896828702
Fatty acid elongation	0.3086284070
Fc epsilon RI signaling pathway	0.2392460598
Fc gamma R-mediated phagocytosis	0.3569686935
Ferroptosis	0.2900827320
Fluid shear stress and atherosclerosis	0.3464430041
Folate biosynthesis	0.2872062535
FoxO signaling pathway	0.3131990945
Fructose and mannose metabolism	0.5010563211
GABAergic synapse	-0.3641640105
Galactose metabolism	0.4094463560
Gap junction	0.1362934964
Gastric acid secretion	0.2069289062
Glioma	0.4278159549
Glucagon signaling pathway	0.4192755265
Glutamatergic synapse	-0.1070258825
Glutathione metabolism	0.2980194686
Glycerolipid metabolism	0.6343980356
Glycerophospholipid metabolism	0.7899260512
Glycine, serine and threonine metabolism	-0.0004954847
Glycolysis / Gluconeogenesis	0.5592886920

Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.4364525562
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.4306733852
Glycosaminoglycan degradation	0.3925444057
Glycosphingolipid biosynthesis - ganglio series	0.2595209211
Glycosphingolipid biosynthesis - globo and isoglobo series	-0.0839387357
Glycosphingolipid biosynthesis - lacto and neolacto series	-0.4293082725
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.4607880216
Glyoxylate and dicarboxylate metabolism	0.2516933852
GnRH signaling pathway	0.2967677167
Graft-versus-host disease	-0.2969446368
Hedgehog signaling pathway	0.2365897321
Hepatitis B	0.3276768860
Hepatitis C	0.4094578949
Herpes simplex infection	0.3362552722
HIF-1 signaling pathway	0.5368275575
Hippo signaling pathway -multiple species	0.3830277355
Histidine metabolism	-0.3343490657
Homologous recombination	0.2408252692
Huntington's disease	0.8156823916
Hypertrophic cardiomyopathy (HCM)	0.2088035293
IL-17 signaling pathway	0.2280316328
Inflammatory bowel disease (IBD)	-0.1639979075
Inflammatory mediator regulation of TRP channels	0.1417605856
Influenza A	0.3269552166
Inositol phosphate metabolism	1.0673210769
Insulin resistance	0.3548480683
Insulin secretion	-0.0975519099
Insulin signaling pathway	0.4635212106
Intestinal immune network for IgA production	-0.1951275840
Legionellosis	-0.0785575474
Leishmaniasis	-0.0418624831
Leukocyte transendothelial migration	0.1557321972
Linoleic acid metabolism	-1.2167791471
Lipoic acid metabolism	-0.0836251072
Long-term depression	0.2296490165
Long-term potentiation	0.2695198104
Longevity regulating pathway	0.6323505249
Longevity regulating pathway - multiple species	0.6137662088
Lysine biosynthesis	-0.0443692253
Lysine degradation	0.6483764407
Malaria	-0.1430900428
Mannose type O-glycan biosynthesis	0.3181495870
Maturity onset diabetes of the young	-0.1527076265
Measles	0.1886807771
Melanogenesis	0.1415529709
Melanoma	0.3527823965

Metabolism of xenobiotics by cytochrome P450	-1.0967791882
Mineral absorption	-0.0178882830
Mitophagy - animal	0.3245463491
Morphine addiction	-0.2239311623
mRNA surveillance pathway	0.6173524654
mTOR signaling pathway	0.4553658012
Mucin type O-glycan biosynthesis	-0.3908533104
N-Glycan biosynthesis	0.7119932584
Natural killer cell mediated cytotoxicity	0.0361004414
Neuroactive ligand-receptor interaction	-0.3688737983
Neurotrophin signaling pathway	0.3348300080
NF-kappa B signaling pathway	0.1812296968
Nicotinate and nicotinamide metabolism	-0.0618858314
Nitrogen metabolism	0.6192657821
NOD-like receptor signaling pathway	0.1324131833
Non-alcoholic fatty liver disease (NAFLD)	0.2247251744
Non-small cell lung cancer	0.4867650078
Notch signaling pathway	0.4363585794
One carbon pool by folate	1.0053935639
Oocyte meiosis	0.6627530355
Osteoclast differentiation	0.1243940355
Ovarian steroidogenesis	0.0593681473
Oxidative phosphorylation	0.4837728968
p53 signaling pathway	0.3417919122
Pancreatic cancer	0.4880994929
Pancreatic secretion	0.1046408607
Pantothenate and CoA biosynthesis	0.1143316246
Parkinson's disease	0.2216004692
Pathogenic Escherichia coli infection	0.3300074612
Pentose and glucuronate interconversions	-0.2670789179
Pentose phosphate pathway	0.3265472313
Peroxisome	0.1333818445
Pertussis	0.0972039185
Phagosome	1.2016145223
Phenylalanine metabolism	-0.0922991056
Phenylalanine, tyrosine and tryptophan biosynthesis	0.3439775000
Phosphatidylinositol signaling system	1.3430764965
Phospholipase D signaling pathway	0.3306107524
Phosphonate and phosphinate metabolism	0.1356444798
Phototransduction	-0.3528362488
Platelet activation	0.2724320126
Platinum drug resistance	0.4264109906
Porphyrin and chlorophyll metabolism	0.0457916695
Primary bile acid biosynthesis	-0.2642042361
Prion diseases	0.3278646005
Progesterone-mediated oocyte maturation	0.2454389249

Prolactin signaling pathway	0.3397458954
Propanoate metabolism	0.3607101074
Prostate cancer	0.4785549447
Protein processing in endoplasmic reticulum	0.4384682575
Proximal tubule bicarbonate reclamation	0.1836214076
Pyrimidine metabolism	1.1988691844
Pyruvate metabolism	0.5185983365
Regulation of lipolysis in adipocytes	0.2177003547
Renal cell carcinoma	0.4347372832
Renin secretion	0.2278585422
Renin-angiotensin system	-0.0568072664
Retinol metabolism	-1.7796037515
Retrograde endocannabinoid signaling	0.1293645042
Rheumatoid arthritis	-0.1389830859
Riboflavin metabolism	0.2869051118
Ribosome biogenesis in eukaryotes	0.3366192115
RIG-I-like receptor signaling pathway	0.2882489716
RNA degradation	0.7385963696
RNA transport	0.4491012166
Salivary secretion	0.0652925787
Salmonella infection	0.4425060940
Selenocompound metabolism	0.3654514548
Serotonergic synapse	-0.1209868215
Shigellosis	0.4098848586
Signaling pathways regulating pluripotency of stem cells	0.3421682252
Small cell lung cancer	0.6328334943
SNARE interactions in vesicular transport	0.4347540202
Sphingolipid metabolism	0.8759845519
Sphingolipid signaling pathway	0.4216047297
Staphylococcus aureus infection	-0.1592678668
Starch and sucrose metabolism	0.3227554697
Steroid biosynthesis	0.4189269760
Steroid hormone biosynthesis	-1.0795958114
Sulfur metabolism	0.5406509003
Sulfur relay system	0.3017439207
Synaptic vesicle cycle	0.5953756294
Synthesis and degradation of ketone bodies	0.1252513768
Systemic lupus erythematosus	-0.2859214708
T cell receptor signaling pathway	0.1876624142
Taste transduction	-0.2878505062
Taurine and hypotaurine metabolism	-0.2983730435
Terpenoid backbone biosynthesis	0.3952159857
TGF-beta signaling pathway	0.2380585699
Th1 and Th2 cell differentiation	-0.0268713391
Th17 cell differentiation	0.1290551276
Thiamine metabolism	0.1176061402

Thyroid cancer	0.3522517926
Thyroid hormone signaling pathway	0.6259631171
Thyroid hormone synthesis	0.0094840448
Tight junction	0.0573458967
TNF signaling pathway	0.2976543497
Toll-like receptor signaling pathway	0.1090157170
Toxoplasmosis	0.2571122014
Transcriptional misregulation in cancer	0.1193314847
Tryptophan metabolism	-0.2712250207
Type I diabetes mellitus	-0.3812234758
Type II diabetes mellitus	0.1801662554
Tyrosine metabolism	-0.3173389753
Ubiquinone and other terpenoid-quinone biosynthesis	0.3080317625
Valine, leucine and isoleucine degradation	0.5600600506
Vascular smooth muscle contraction	0.1777071619
Vasopressin-regulated water reabsorption	0.0026758640
VEGF signaling pathway	0.2842564938
Vibrio cholerae infection	0.3968586370
Viral carcinogenesis	0.3542866608
Viral myocarditis	0.1652953612
Vitamin B6 metabolism	0.0804551871
Vitamin digestion and absorption	-0.4153976092
Wnt signaling pathway	0.1611165990
	sample.Max.
Acute myeloid leukemia	0.441017081
Adherens junction	0.579861480
Adipocytokine signaling pathway	0.232617508
Adrenergic signaling in cardiomyocytes	-0.253658624
African trypanosomiasis	-0.157941043
AGE-RAGE signaling pathway in diabetic complications	0.298406971
Alanine, aspartate and glutamate metabolism	0.605953978
Aldosterone synthesis and secretion	0.179059640
Aldosterone-regulated sodium reabsorption	0.183358522
Allograft rejection	-0.148057427
alpha-Linolenic acid metabolism	0.065702324
Alzheimer's disease	0.318195573
Amino sugar and nucleotide sugar metabolism	0.459856185
Aminoacyl-tRNA biosynthesis	0.317797890
Amoebiasis	-0.054378929
Amphetamine addiction	-0.025976561
AMPK signaling pathway	0.482923369
Amyotrophic lateral sclerosis (ALS)	0.207462953
Antifolate resistance	0.053878868
Antigen processing and presentation	-0.105953759
Apelin signaling pathway	0.350191666
Apoptosis	0.361830940

Arachidonic acid metabolism	-0.802063505
Arginine and proline metabolism	-0.014374179
Arginine biosynthesis	0.314523447
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.343916267
Ascorbate and aldarate metabolism	-0.529464435
Asthma	-0.367766375
Autoimmune thyroid disease	-0.354877997
Autophagy - animal	0.518578171
Autophagy - other	0.671631904
B cell receptor signaling pathway	0.154833612
Bacterial invasion of epithelial cells	0.497076788
Basal cell carcinoma	0.108029061
beta-Alanine metabolism	-0.130183653
Bile secretion	0.016634649
Biosynthesis of unsaturated fatty acids	0.266022702
Biotin metabolism	0.274826194
Bladder cancer	0.478046561
Breast cancer	0.363553211
Butanoate metabolism	0.184236941
Caffeine metabolism	-0.353764771
Carbohydrate digestion and absorption	0.142215730
Cardiac muscle contraction	-0.176267864
Cell adhesion molecules (CAMs)	-0.198893533
Cell cycle	0.994411151
Central carbon metabolism in cancer	0.531330519
Chagas disease (American trypanosomiasis)	0.307940967
Chemical carcinogenesis	-0.808392519
Choline metabolism in cancer	0.324143982
Cholinergic synapse	0.176464138
Chronic myeloid leukemia	0.585544532
Circadian entrainment	0.003920312
Circadian rhythm	0.530783519
Citrate cycle (TCA cycle)	0.928847646
Cocaine addiction	0.041760659
Colorectal cancer	0.419262351
Complement and coagulation cascades	-0.203480876
Cysteine and methionine metabolism	0.552979848
Cytosolic DNA-sensing pathway	0.256084137
D-Glutamine and D-glutamate metabolism	0.361366441
Dilated cardiomyopathy	0.190774528
Dopaminergic synapse	0.074824220
Dorso-ventral axis formation	0.304006162
Drug metabolism - cytochrome P450	-0.458133820
Drug metabolism - other enzymes	0.085891579
ECM-receptor interaction	0.444082429
EGFR tyrosine kinase inhibitor resistance	0.495330636

Endocrine and other factor-regulated calcium reabsorption	-0.077586630
Endocrine resistance	0.448645537
Endocytosis	0.648053894
Endometrial cancer	0.540850641
Epithelial cell signaling in Helicobacter pylori infection	0.191477963
Epstein-Barr virus infection	0.376759212
ErbB signaling pathway	0.386210932
Estrogen signaling pathway	0.208198046
Ether lipid metabolism	0.287240896
Fanconi anemia pathway	0.701920737
Fat digestion and absorption	0.337509503
Fatty acid biosynthesis	0.380223996
Fatty acid degradation	0.594455250
Fatty acid elongation	0.318805611
Fc epsilon RI signaling pathway	0.258544488
Fc gamma R-mediated phagocytosis	0.370209560
Ferroptosis	0.295202986
Fluid shear stress and atherosclerosis	0.354930167
Folate biosynthesis	0.290817833
FoxO signaling pathway	0.319967568
Fructose and mannose metabolism	0.535684104
GABAergic synapse	-0.342802160
Galactose metabolism	0.525726741
Gap junction	0.138405026
Gastric acid secretion	0.218662142
Glioma	0.431598345
Glucagon signaling pathway	0.437729266
Glutamatergic synapse	-0.103931525
Glutathione metabolism	0.328966072
Glycerolipid metabolism	0.704267210
Glycerophospholipid metabolism	0.911070332
Glycine, serine and threonine metabolism	0.037740101
Glycolysis / Gluconeogenesis	0.601459487
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.451931196
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.435929736
Glycosaminoglycan degradation	0.396557470
Glycosphingolipid biosynthesis - ganglio series	0.263975006
Glycosphingolipid biosynthesis - globo and isoglobo series	-0.078628444
Glycosphingolipid biosynthesis - lacto and neolacto series	-0.367895587
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.477682207
Glyoxylate and dicarboxylate metabolism	0.252006492
GnRH signaling pathway	0.297621414
Graft-versus-host disease	-0.287948298
Hedgehog signaling pathway	0.245088035
Hepatitis B	0.336529323
Hepatitis C	0.423670314

Herpes simplex infection	0.346110713
HIF-1 signaling pathway	0.561561910
Hippo signaling pathway -multiple species	0.387178296
Histidine metabolism	-0.324128162
Homologous recombination	0.246795859
Huntington's disease	0.830251678
Hypertrophic cardiomyopathy (HCM)	0.219494442
IL-17 signaling pathway	0.232840619
Inflammatory bowel disease (IBD)	-0.161144693
Inflammatory mediator regulation of TRP channels	0.151400695
Influenza A	0.333356787
Inositol phosphate metabolism	1.078941525
Insulin resistance	0.373158158
Insulin secretion	-0.073553342
Insulin signaling pathway	0.463557391
Intestinal immune network for IgA production	-0.191148345
Legionellosis	-0.072511819
Leishmaniasis	-0.030654969
Leukocyte transendothelial migration	0.174910705
Linoleic acid metabolism	-1.183112369
Lipoic acid metabolism	-0.072571411
Long-term depression	0.233865133
Long-term potentiation	0.271381922
Longevity regulating pathway	0.634913604
Longevity regulating pathway - multiple species	0.627351618
Lysine biosynthesis	0.075301392
Lysine degradation	0.656147449
Malaria	-0.095393292
Mannose type O-glycan biosynthesis	0.330134961
Maturity onset diabetes of the young	-0.151973690
Measles	0.194376724
Melanogenesis	0.159958762
Melanoma	0.489153528
Metabolism of xenobiotics by cytochrome P450	-1.094862004
Mineral absorption	-0.012960478
Mitophagy - animal	0.325463605
Morphine addiction	-0.156123486
mRNA surveillance pathway	0.622555592
mTOR signaling pathway	0.466316678
Mucin type O-glycan biosynthesis	-0.319154078
N-Glycan biosynthesis	0.722032018
Natural killer cell mediated cytotoxicity	0.053836433
Neuroactive ligand-receptor interaction	-0.368014008
Neurotrophin signaling pathway	0.343343186
NF-kappa B signaling pathway	0.196363757
Nicotinate and nicotinamide metabolism	-0.050838931

Nitrogen metabolism	0.619744975
NOD-like receptor signaling pathway	0.144670752
Non-alcoholic fatty liver disease (NAFLD)	0.246799749
Non-small cell lung cancer	0.493663378
Notch signaling pathway	0.455785041
One carbon pool by folate	1.027424866
Oocyte meiosis	0.691219447
Osteoclast differentiation	0.133483255
Ovarian steroidogenesis	0.089868979
Oxidative phosphorylation	0.488175800
p53 signaling pathway	0.353382518
Pancreatic cancer	0.499008542
Pancreatic secretion	0.152474377
Pantothenate and CoA biosynthesis	0.119538300
Parkinson's disease	0.235406843
Pathogenic Escherichia coli infection	0.330387323
Pentose and glucuronate interconversions	-0.244754302
Pentose phosphate pathway	0.447718015
Peroxisome	0.140716371
Pertussis	0.119628321
Phagosome	1.251580461
Phenylalanine metabolism	-0.084926513
Phenylalanine, tyrosine and tryptophan biosynthesis	0.345984156
Phosphatidylinositol signaling system	1.368576410
Phospholipase D signaling pathway	0.335744256
Phosphonate and phosphinate metabolism	0.139521256
Phototransduction	-0.333778289
Platelet activation	0.280799843
Platinum drug resistance	0.432927277
Porphyrin and chlorophyll metabolism	0.057896876
Primary bile acid biosynthesis	-0.251368106
Prion diseases	0.355170656
Progesterone-mediated oocyte maturation	0.247946388
Prolactin signaling pathway	0.347547269
Propanoate metabolism	0.377501949
Prostate cancer	0.478879967
Protein processing in endoplasmic reticulum	0.442036945
Proximal tubule bicarbonate reclamation	0.184407300
Pyrimidine metabolism	1.299144904
Pyruvate metabolism	0.535990652
Regulation of lipolysis in adipocytes	0.236582033
Renal cell carcinoma	0.454182329
Renin secretion	0.237058281
Renin-angiotensin system	0.145441993
Retinol metabolism	-1.695962241
Retrograde endocannabinoid signaling	0.174363891

Rheumatoid arthritis	-0.127536142
Riboflavin metabolism	0.359054732
Ribosome biogenesis in eukaryotes	0.347780991
RIG-I-like receptor signaling pathway	0.296329860
RNA degradation	0.749293342
RNA transport	0.466764812
Salivary secretion	0.074229361
Salmonella infection	0.454100024
Selenocompound metabolism	0.384983949
Serotonergic synapse	-0.083899835
Shigellosis	0.435015685
Signaling pathways regulating pluripotency of stem cells	0.352326621
Small cell lung cancer	0.645336462
SNARE interactions in vesicular transport	0.435794208
Sphingolipid metabolism	0.952559455
Sphingolipid signaling pathway	0.438929920
Staphylococcus aureus infection	-0.124629912
Starch and sucrose metabolism	0.353089651
Steroid biosynthesis	0.455091486
Steroid hormone biosynthesis	-1.008838574
Sulfur metabolism	0.544437582
Sulfur relay system	0.319884690
Synaptic vesicle cycle	0.603156011
Synthesis and degradation of ketone bodies	0.151964673
Systemic lupus erythematosus	-0.257864258
T cell receptor signaling pathway	0.188835827
Taste transduction	-0.260392424
Taurine and hypotaurine metabolism	-0.292506644
Terpenoid backbone biosynthesis	0.399859858
TGF-beta signaling pathway	0.245172450
Th1 and Th2 cell differentiation	0.004443134
Th17 cell differentiation	0.131682738
Thiamine metabolism	0.121904952
Thyroid cancer	0.360327278
Thyroid hormone signaling pathway	0.632787493
Thyroid hormone synthesis	0.012126710
Tight junction	0.062672686
TNF signaling pathway	0.301942299
Toll-like receptor signaling pathway	0.118216053
Toxoplasmosis	0.261567102
Transcriptional misregulation in cancer	0.120176956
Tryptophan metabolism	-0.253227305
Type I diabetes mellitus	-0.345211715
Type II diabetes mellitus	0.187882158
Tyrosine metabolism	-0.285281365
Ubiquinone and other terpenoid-quinone biosynthesis	0.316668640

Valine, leucine and isoleucine degradation	0.571341261
Vascular smooth muscle contraction	0.179933537
Vasopressin-regulated water reabsorption	0.082957115
VEGF signaling pathway	0.286647096
Vibrio cholerae infection	0.418536277
Viral carcinogenesis	0.365218363
Viral myocarditis	0.172663707
Vitamin B6 metabolism	0.141295288
Vitamin digestion and absorption	-0.406966522
Wnt signaling pathway	0.179729323
	p.value
Acute myeloid leukemia	4.679187e-01
Adherens junction	5.117874e-02
Adipocytokine signaling pathway	1.651983e-01
Adrenergic signaling in cardiomyocytes	7.623547e-01
African trypanosomiasis	4.682416e-01
AGE-RAGE signaling pathway in diabetic complications	3.012445e-01
Alanine, aspartate and glutamate metabolism	9.493295e-02
Aldosterone synthesis and secretion	1.160445e-01
Aldosterone-regulated sodium reabsorption	5.774420e-01
Allograft rejection	5.133788e-01
alpha-Linolenic acid metabolism	1.608778e-01
Alzheimer's disease	1.691319e-01
Amino sugar and nucleotide sugar metabolism	9.246784e-02
Aminoacyl-tRNA biosynthesis	8.342750e-01
Amoebiasis	6.960623e-01
Amphetamine addiction	3.314156e-03
AMPK signaling pathway	6.656533e-01
Amyotrophic lateral sclerosis (ALS)	2.354015e-01
Antifolate resistance	6.937443e-01
Antigen processing and presentation	1.139761e-02
Apelin signaling pathway	2.588821e-01
Apoptosis	9.293740e-01
Arachidonic acid metabolism	2.546850e-02
Arginine and proline metabolism	8.425275e-02
Arginine biosynthesis	6.769146e-01
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	4.576018e-01
Ascorbate and aldarate metabolism	1.569735e-01
Asthma	9.807357e-03
Autoimmune thyroid disease	3.620127e-01
Autophagy - animal	4.386354e-01
Autophagy - other	3.971303e-03
B cell receptor signaling pathway	2.844850e-01
Bacterial invasion of epithelial cells	3.133533e-01
Basal cell carcinoma	2.101500e-03
beta-Alanine metabolism	9.344103e-01

Bile secretion	9.248535e-01
Biosynthesis of unsaturated fatty acids	7.007793e-01
Biotin metabolism	5.909040e-01
Bladder cancer	1.837957e-01
Breast cancer	1.904335e-02
Butanoate metabolism	2.993934e-01
Caffeine metabolism	3.638314e-02
Carbohydrate digestion and absorption	6.212188e-02
Cardiac muscle contraction	7.878523e-01
Cell adhesion molecules (CAMs)	5.890342e-01
Cell cycle	1.846657e-03
Central carbon metabolism in cancer	5.817186e-03
Chagas disease (American trypanosomiasis)	4.339063e-01
Chemical carcinogenesis	2.907213e-01
Choline metabolism in cancer	7.379284e-03
Cholinergic synapse	3.677029e-01
Chronic myeloid leukemia	3.874615e-01
Circadian entrainment	8.805035e-01
Circadian rhythm	2.025562e-05
Citrate cycle (TCA cycle)	3.967858e-01
Cocaine addiction	8.874662e-01
Colorectal cancer	9.205659e-01
Complement and coagulation cascades	7.306283e-02
Cysteine and methionine metabolism	4.010081e-01
Cytosolic DNA-sensing pathway	8.123825e-01
D-Glutamine and D-glutamate metabolism	3.422198e-02
Dilated cardiomyopathy	2.163240e-02
Dopaminergic synapse	6.608167e-01
Dorso-ventral axis formation	2.200867e-01
Drug metabolism - cytochrome P450	8.345425e-02
Drug metabolism - other enzymes	4.890267e-01
ECM-receptor interaction	4.307883e-02
EGFR tyrosine kinase inhibitor resistance	8.896369e-02
Endocrine and other factor-regulated calcium reabsorption	6.800278e-01
Endocrine resistance	1.527509e-02
Endocytosis	1.182425e-02
Endometrial cancer	9.539643e-01
Epithelial cell signaling in Helicobacter pylori infection	6.307648e-03
Epstein-Barr virus infection	4.731113e-02
ErbB signaling pathway	4.800363e-01
Estrogen signaling pathway	9.892045e-02
Ether lipid metabolism	5.729844e-01
Fanconi anemia pathway	4.506133e-02
Fat digestion and absorption	9.823653e-03
Fatty acid biosynthesis	1.323411e-01
Fatty acid degradation	1.408528e-01

Fatty acid elongation	5.623178e-02
Fc epsilon RI signaling pathway	4.241433e-01
Fc gamma R-mediated phagocytosis	2.615663e-01
Ferroptosis	9.350340e-02
Fluid shear stress and atherosclerosis	2.609388e-01
Folate biosynthesis	4.207022e-01
FoxO signaling pathway	5.366351e-01
Fructose and mannose metabolism	7.790316e-01
GABAergic synapse	6.242181e-01
Galactose metabolism	7.394396e-01
Gap junction	9.655488e-02
Gastric acid secretion	1.552802e-01
Glioma	1.548034e-01
Glucagon signaling pathway	4.187923e-01
Glutamatergic synapse	8.664972e-01
Glutathione metabolism	3.771793e-01
Glycerolipid metabolism	2.321556e-02
Glycerophospholipid metabolism	6.202848e-01
Glycine, serine and threonine metabolism	2.890067e-01
Glycolysis / Gluconeogenesis	9.089287e-01
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	5.834182e-01
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	6.083384e-01
Glycosaminoglycan degradation	1.698663e-01
Glycosphingolipid biosynthesis - ganglio series	5.480292e-01
Glycosphingolipid biosynthesis - globo and isoglobo series	8.745677e-01
Glycosphingolipid biosynthesis - lacto and neolacto series	8.360255e-01
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	8.525705e-01
Glyoxylate and dicarboxylate metabolism	3.411235e-02
GnRH signaling pathway	2.891585e-02
Graft-versus-host disease	1.754120e-01
Hedgehog signaling pathway	3.881699e-01
Hepatitis B	5.722936e-01
Hepatitis C	3.957628e-01
Herpes simplex infection	1.086049e-01
HIF-1 signaling pathway	4.507151e-01
Hippo signaling pathway -multiple species	1.185621e-02
Histidine metabolism	8.095896e-02
Homologous recombination	9.539433e-03
Huntington's disease	1.654663e-01
Hypertrophic cardiomyopathy (HCM)	7.195646e-03
IL-17 signaling pathway	9.936334e-01
Inflammatory bowel disease (IBD)	1.827232e-02
Inflammatory mediator regulation of TRP channels	5.283217e-01
Influenza A	1.549479e-01
Inositol phosphate metabolism	7.361464e-01
Insulin resistance	1.335977e-02

Insulin secretion	5.217811e-01
Insulin signaling pathway	4.314436e-02
Intestinal immune network for IgA production	3.193241e-01
Legionellosis	5.494098e-01
Leishmaniasis	3.053899e-01
Leukocyte transendothelial migration	2.147696e-02
Linoleic acid metabolism	3.211003e-02
Lipoic acid metabolism	1.551629e-01
Long-term depression	3.576669e-01
Long-term potentiation	9.067169e-02
Longevity regulating pathway	6.320429e-01
Longevity regulating pathway - multiple species	7.662647e-01
Lysine biosynthesis	1.904448e-01
Lysine degradation	1.179388e-02
Malaria	4.080270e-01
Mannose type O-glycan biosynthesis	8.814164e-02
Maturity onset diabetes of the young	5.769450e-01
Measles	8.548674e-01
Melanogenesis	1.235638e-01
Melanoma	3.889056e-01
Metabolism of xenobiotics by cytochrome P450	6.339641e-01
Mineral absorption	3.341493e-01
Mitophagy - animal	2.340428e-01
Morphine addiction	9.645343e-01
mRNA surveillance pathway	2.120504e-03
mTOR signaling pathway	6.489611e-03
Mucin type O-glycan biosynthesis	1.419736e-01
N-Glycan biosynthesis	6.200608e-01
Natural killer cell mediated cytotoxicity	8.703946e-03
Neuroactive ligand-receptor interaction	5.721175e-01
Neurotrophin signaling pathway	2.978916e-01
NF-kappa B signaling pathway	5.194552e-01
Nicotinate and nicotinamide metabolism	8.947444e-01
Nitrogen metabolism	1.198404e-02
NOD-like receptor signaling pathway	8.049720e-01
Non-alcoholic fatty liver disease (NAFLD)	9.007188e-01
Non-small cell lung cancer	6.937251e-01
Notch signaling pathway	4.779441e-01
One carbon pool by folate	2.349021e-02
Oocyte meiosis	7.021160e-03
Osteoclast differentiation	3.341352e-01
Ovarian steroidogenesis	8.036325e-01
Oxidative phosphorylation	1.070940e-01
p53 signaling pathway	7.371133e-02
Pancreatic cancer	1.658437e-01
Pancreatic secretion	5.256014e-01

Pantothenate and CoA biosynthesis	2.736899e-02
Parkinson's disease	1.491651e-01
Pathogenic Escherichia coli infection	4.480331e-01
Pentose and glucuronate interconversions	1.283518e-01
Pentose phosphate pathway	5.329301e-01
Peroxisome	4.364265e-01
Pertussis	3.423775e-01
Phagosome	5.492808e-01
Phenylalanine metabolism	3.569737e-01
Phenylalanine, tyrosine and tryptophan biosynthesis	6.245936e-04
Phosphatidylinositol signaling system	7.232668e-01
Phospholipase D signaling pathway	1.019323e-01
Phosphonate and phosphinate metabolism	1.949615e-01
Phototransduction	9.316823e-01
Platelet activation	1.274917e-01
Platinum drug resistance	4.113775e-01
Porphyrin and chlorophyll metabolism	4.651927e-01
Primary bile acid biosynthesis	9.450461e-01
Prion diseases	9.646282e-01
Progesterone-mediated oocyte maturation	3.721440e-01
Prolactin signaling pathway	8.024226e-01
Propanoate metabolism	3.063600e-01
Prostate cancer	3.351046e-01
Protein processing in endoplasmic reticulum	5.522655e-01
Proximal tubule bicarbonate reclamation	6.942137e-01
Pyrimidine metabolism	1.357200e-01
Pyruvate metabolism	3.134621e-01
Regulation of lipolysis in adipocytes	9.251571e-01
Renal cell carcinoma	3.570001e-01
Renin secretion	8.958129e-01
Renin-angiotensin system	4.675981e-01
Retinol metabolism	1.682504e-01
Retrograde endocannabinoid signaling	8.284499e-01
Rheumatoid arthritis	2.880170e-01
Riboflavin metabolism	5.480992e-02
Ribosome biogenesis in eukaryotes	8.636707e-02
RIG-I-like receptor signaling pathway	8.665204e-01
RNA degradation	9.176075e-05
RNA transport	1.165443e-03
Salivary secretion	6.766149e-01
Salmonella infection	2.262457e-01
Selenocompound metabolism	3.287668e-01
Serotonergic synapse	5.180676e-01
Shigellosis	2.532261e-01
Signaling pathways regulating pluripotency of stem cells	5.843599e-02
Small cell lung cancer	8.860703e-01

SNARE interactions in vesicular transport	6.812914e-01
Sphingolipid metabolism	8.673091e-01
Sphingolipid signaling pathway	9.823105e-02
Staphylococcus aureus infection	2.228559e-01
Starch and sucrose metabolism	1.301751e-02
Steroid biosynthesis	7.601862e-01
Steroid hormone biosynthesis	9.406965e-02
Sulfur metabolism	1.841501e-01
Sulfur relay system	5.988330e-01
Synaptic vesicle cycle	4.780804e-01
Synthesis and degradation of ketone bodies	8.645675e-02
Systemic lupus erythematosus	1.943895e-01
T cell receptor signaling pathway	5.052094e-02
Taste transduction	2.196767e-02
Taurine and hypotaurine metabolism	4.036299e-02
Terpenoid backbone biosynthesis	1.941051e-01
TGF-beta signaling pathway	4.213100e-01
Th1 and Th2 cell differentiation	4.613564e-01
Th17 cell differentiation	7.239877e-01
Thiamine metabolism	1.396530e-04
Thyroid cancer	5.796910e-02
Thyroid hormone signaling pathway	4.341664e-01
Thyroid hormone synthesis	6.848458e-01
Tight junction	3.551548e-02
TNF signaling pathway	4.547101e-01
Toll-like receptor signaling pathway	6.850776e-02
Toxoplasmosis	8.408384e-01
Transcriptional misregulation in cancer	9.484421e-02
Tryptophan metabolism	8.721772e-01
Type I diabetes mellitus	3.637074e-01
Type II diabetes mellitus	3.081460e-01
Tyrosine metabolism	4.305364e-01
Ubiquinone and other terpenoid-quinone biosynthesis	5.242640e-01
Valine, leucine and isoleucine degradation	5.477987e-01
Vascular smooth muscle contraction	1.146833e-01
Vasopressin-regulated water reabsorption	2.905184e-01
VEGF signaling pathway	1.547803e-02
Vibrio cholerae infection	3.723576e-01
Viral carcinogenesis	3.151456e-02
Viral myocarditis	6.685908e-01
Vitamin B6 metabolism	5.767118e-02
Vitamin digestion and absorption	6.983628e-02
Wnt signaling pathway	3.579422e-02

	q.value
Acute myeloid leukemia	0.705053490
Adherens junction	0.252996779

Adipocytokine signaling pathway	0.427932456
Adrenergic signaling in cardiomyocytes	0.883791727
African trypanosomiasis	0.705053490
AGE-RAGE signaling pathway in diabetic complications	0.616292062
Alanine, aspartate and glutamate metabolism	0.327268844
Aldosterone synthesis and secretion	0.361948404
Aldosterone-regulated sodium reabsorption	0.767968565
Allograft rejection	0.748217695
alpha-Linolenic acid metabolism	0.427932456
Alzheimer's disease	0.427932456
Amino sugar and nucleotide sugar metabolism	0.327268844
Aminoacyl-tRNA biosynthesis	0.928129952
Amoebiasis	0.832732024
Amphetamine addiction	0.096478775
AMPK signaling pathway	0.832732024
Amyotrophic lateral sclerosis (ALS)	0.531682796
Antifolate resistance	0.832732024
Antigen processing and presentation	0.125592753
Apelin signaling pathway	0.571086496
Apoptosis	0.952589451
Arachidonic acid metabolism	0.180344522
Arginine and proline metabolism	0.327268844
Arginine biosynthesis	0.832732024
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.705053490
Ascorbate and aldarate metabolism	0.423990165
Asthma	0.125592753
Autoimmune thyroid disease	0.661745466
Autophagy - animal	0.696499780
Autophagy - other	0.104048137
B cell receptor signaling pathway	0.609351904
Bacterial invasion of epithelial cells	0.617496679
Basal cell carcinoma	0.069446510
beta-Alanine metabolism	0.952589451
Bile secretion	0.952589451
Biosynthesis of unsaturated fatty acids	0.834564466
Biotin metabolism	0.774084204
Bladder cancer	0.450909699
Breast cancer	0.160947055
Butanoate metabolism	0.616292062
Caffeine metabolism	0.207225729
Carbohydrate digestion and absorption	0.275863272
Cardiac muscle contraction	0.901385606
Cell adhesion molecules (CAMs)	0.774084204
Cell cycle	0.069446510
Central carbon metabolism in cancer	0.120835775
Chagas disease (American trypanosomiasis)	0.696499780

Chemical carcinogenesis	0.609351904
Choline metabolism in cancer	0.120835775
Cholinergic synapse	0.663657840
Chronic myeloid leukemia	0.674789836
Circadian entrainment	0.941360920
Circadian rhythm	0.005306973
Citrate cycle (TCA cycle)	0.679463338
Cocaine addiction	0.941360920
Colorectal cancer	0.952589451
Complement and coagulation cascades	0.306545530
Cysteine and methionine metabolism	0.682234631
Cytosolic DNA-sensing pathway	0.913494490
D-Glutamine and D-glutamate metabolism	0.207225729
Dilated cardiomyopathy	0.169280292
Dopaminergic synapse	0.832374831
Dorso-ventral axis formation	0.514845716
Drug metabolism - cytochrome P450	0.327268844
Drug metabolism - other enzymes	0.719803353
ECM-receptor interaction	0.230690257
EGFR tyrosine kinase inhibitor resistance	0.327268844
Endocrine and other factor-regulated calcium reabsorption	0.832732024
Endocrine resistance	0.139835983
Endocytosis	0.125592753
Endometrial cancer	0.965014047
Epithelial cell signaling in Helicobacter pylori infection	0.120835775
Epstein-Barr virus infection	0.243049339
ErbB signaling pathway	0.710562254
Estrogen signaling pathway	0.328065290
Ether lipid metabolism	0.767968565
Fanconi anemia pathway	0.236121376
Fat digestion and absorption	0.125592753
Fatty acid biosynthesis	0.394015434
Fatty acid degradation	0.408759263
Fatty acid elongation	0.263969455
Fc epsilon RI signaling pathway	0.694534652
Fc gamma R-mediated phagocytosis	0.571086496
Ferroptosis	0.327268844
Fluid shear stress and atherosclerosis	0.571086496
Folate biosynthesis	0.694234062
FoxO signaling pathway	0.751863024
Fructose and mannose metabolism	0.895203002
GABAergic synapse	0.797781206
Galactose metabolism	0.864880221
Gap junction	0.328065290
Gastric acid secretion	0.423785630
Glioma	0.423785630

Glucagon signaling pathway	0.694234062
Glutamatergic synapse	0.938987581
Glutathione metabolism	0.667709273
Glycerolipid metabolism	0.170956554
Glycerophospholipid metabolism	0.796640257
Glycine, serine and threonine metabolism	0.609351904
Glycolysis / Gluconeogenesis	0.948762270
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.771997838
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.789032923
Glycosaminoglycan degradation	0.427932456
Glycosphingolipid biosynthesis - ganglio series	0.753612333
Glycosphingolipid biosynthesis - globo and isoglobo series	0.939085037
Glycosphingolipid biosynthesis - lacto and neolacto series	0.928129952
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.937134925
Glyoxylate and dicarboxylate metabolism	0.207225729
GnRH signaling pathway	0.194255205
Graft-versus-host disease	0.437694807
Hedgehog signaling pathway	0.674789836
Hepatitis B	0.767968565
Hepatitis C	0.679463338
Herpes simplex infection	0.347005875
HIF-1 signaling pathway	0.705053490
Hippo signaling pathway -multiple species	0.125592753
Histidine metabolism	0.327268844
Homologous recombination	0.125592753
Huntington's disease	0.427932456
Hypertrophic cardiomyopathy (HCM)	0.120835775
IL-17 signaling pathway	0.993633417
Inflammatory bowel disease (IBD)	0.159578270
Inflammatory mediator regulation of TRP channels	0.748217695
Influenza A	0.423785630
Inositol phosphate metabolism	0.864880221
Insulin resistance	0.129639219
Insulin secretion	0.748217695
Insulin signaling pathway	0.230690257
Intestinal immune network for IgA production	0.624350106
Legionellosis	0.753612333
Leishmaniasis	0.616292062
Leukocyte transendothelial migration	0.169280292
Linoleic acid metabolism	0.205190913
Lipoic acid metabolism	0.423785630
Long-term depression	0.659920671
Long-term potentiation	0.327268844
Longevity regulating pathway	0.802408692
Longevity regulating pathway - multiple species	0.884411245
Lysine biosynthesis	0.460179456

Lysine degradation	0.125592753
Malaria	0.689697276
Mannose type O-glycan biosynthesis	0.327268844
Maturity onset diabetes of the young	0.767968565
Measles	0.937134925
Melanogenesis	0.380867117
Melanoma	0.674789836
Metabolism of xenobiotics by cytochrome P450	0.802408692
Mineral absorption	0.636213116
Mitophagy - animal	0.531682796
Morphine addiction	0.968324083
mRNA surveillance pathway	0.069446510
mTOR signaling pathway	0.120835775
Mucin type O-glycan biosynthesis	0.408759263
N-Glycan biosynthesis	0.796640257
Natural killer cell mediated cytotoxicity	0.125592753
Neuroactive ligand-receptor interaction	0.767968565
Neurotrophin signaling pathway	0.616292062
NF-kappa B signaling pathway	0.748217695
Nicotinate and nicotinamide metabolism	0.942582222
Nitrogen metabolism	0.125592753
NOD-like receptor signaling pathway	0.909063192
Non-alcoholic fatty liver disease (NAFLD)	0.943953296
Non-small cell lung cancer	0.832732024
Notch signaling pathway	0.710562254
One carbon pool by folate	0.170956554
Oocyte meiosis	0.120835775
Osteoclast differentiation	0.636213116
Ovarian steroidogenesis	0.909063192
Oxidative phosphorylation	0.346402774
p53 signaling pathway	0.306545530
Pancreatic cancer	0.427932456
Pancreatic secretion	0.748217695
Pantothenate and CoA biosynthesis	0.188701965
Parkinson's disease	0.423785630
Pathogenic Escherichia coli infection	0.705053490
Pentose and glucuronate interconversions	0.386530827
Pentose phosphate pathway	0.750686466
Peroxisome	0.696499780
Pertussis	0.645344724
Phagosome	0.753612333
Phenylalanine metabolism	0.659920671
Phenylalanine, tyrosine and tryptophan biosynthesis	0.040910882
Phosphatidylinositol signaling system	0.854435926
Phospholipase D signaling pathway	0.333828311
Phosphonate and phosphinate metabolism	0.460179456

Phototransduction	0.952589451
Platelet activation	0.386530827
Platinum drug resistance	0.690903173
Porphyrin and chlorophyll metabolism	0.705053490
Primary bile acid biosynthesis	0.959697983
Prion diseases	0.968324083
Progesterone-mediated oocyte maturation	0.663657840
Prolactin signaling pathway	0.909063192
Propanoate metabolism	0.616292062
Prostate cancer	0.636213116
Protein processing in endoplasmic reticulum	0.753612333
Proximal tubule bicarbonate reclamation	0.832732024
Pyrimidine metabolism	0.399535421
Pyruvate metabolism	0.617496679
Regulation of lipolysis in adipocytes	0.952589451
Renal cell carcinoma	0.659920671
Renin secretion	0.942582222
Renin-angiotensin system	0.705053490
Retinol metabolism	0.427932456
Retrograde endocannabinoid signaling	0.927580634
Rheumatoid arthritis	0.609351904
Riboflavin metabolism	0.263969455
Ribosome biogenesis in eukaryotes	0.327268844
RIG-I-like receptor signaling pathway	0.938987581
RNA degradation	0.012020659
RNA transport	0.061069232
Salivary secretion	0.832732024
Salmonella infection	0.519968206
Selenocompound metabolism	0.636213116
Serotonergic synapse	0.748217695
Shigellosis	0.567053408
Signaling pathways regulating pluripotency of stem cells	0.263969455
Small cell lung cancer	0.941360920
SNARE interactions in vesicular transport	0.832732024
Sphingolipid metabolism	0.938987581
Sphingolipid signaling pathway	0.328065290
Staphylococcus aureus infection	0.516710059
Starch and sucrose metabolism	0.129639219
Steroid biosynthesis	0.883791727
Steroid hormone biosynthesis	0.327268844
Sulfur metabolism	0.450909699
Sulfur relay system	0.780568445
Synaptic vesicle cycle	0.710562254
Synthesis and degradation of ketone bodies	0.327268844
Systemic lupus erythematosus	0.460179456
T cell receptor signaling pathway	0.252996779

```
Taste transduction                                                  0.169280292
Taurine and hypotaurine metabolism                                  0.225002172
Terpenoid backbone biosynthesis                                     0.460179456
TGF-beta signaling pathway                                          0.694234062
Th1 and Th2 cell differentiation                                    0.705053490
Th17 cell differentiation                                           0.854435926
Thiamine metabolism                                                 0.012196366
Thyroid cancer                                                      0.263969455
Thyroid hormone signaling pathway                                   0.696499780
Thyroid hormone synthesis                                           0.832732024
Tight junction                                                      0.207225729
TNF signaling pathway                                               0.705053490
Toll-like receptor signaling pathway                                0.299150552
Toxoplasmosis                                                       0.929534380
Transcriptional misregulation in cancer                             0.327268844
Tryptophan metabolism                                               0.939085037
Type I diabetes mellitus                                            0.661745466
Type II diabetes mellitus                                           0.616292062
Tyrosine metabolism                                                 0.696499780
Ubiquinone and other terpenoid-quinone biosynthesis                 0.748217695
Valine, leucine and isoleucine degradation                          0.753612333
Vascular smooth muscle contraction                                  0.361948404
Vasopressin-regulated water reabsorption                            0.609351904
VEGF signaling pathway                                              0.139835983
Vibrio cholerae infection                                           0.663657840
Viral carcinogenesis                                                0.205190913
Viral myocarditis                                                   0.832732024
Vitamin B6 metabolism                                               0.263969455
Vitamin digestion and absorption                                    0.299952561
Wnt signaling pathway                                               0.207225729

$errors
named list()
```

Apart from the expected arguments: a gene expression data matrix, a vector of class labels and a list of pathways, the user needs to specify the `type` argument which decides on the type of the data (`"MA"` is used for expression microarray and `"RNASeq"` for RNA-Seq data). The others arguments are optional. Arguments `convertTo` and `convertBy` control the conversion of the node labels in the pathways. The default setting is `convertTo="none"` which performs no conversion. Please note, that the node labels should be the same as the rownames of gene expression data matrix. The user can also specified whether the normalization step (standardization and sigma-transformation) should be perfomed (`normalize=TRUE`). If `verbose=TRUE`, function prints out the titles of pathways as their are analysed. The implementation returns also a gene-level statistics of the differential expression of genes. These statistics are later used

in the visualization of a selected pathway.

3.6 PRS

PRS is another method that works with gene-level statistics and a list of differentially expresed genes. The pathway topology is incorporated as the number of downstream differentially expressed genes. The gene-level log fold-changes are weigted by this numeber and sumed up into a pathway-level score. A statistical significance is assessed by a permutations of genes.

```
> Prs<-PRS(hnrnp.cnts, group, pathways, type="RNASeq",  logFC.th=-1, nperm=100)

15481 node labels mapped to the expression data
Average coverage 85.24048 %
0 (out of 285) pathways without a mapped node

> res(Prs)

$results
```

	nPRS
Acute myeloid leukemia	0.648393488
Adherens junction	2.198902134
Adipocytokine signaling pathway	0.204344103
Adrenergic signaling in cardiomyocytes	-0.662267850
African trypanosomiasis	-0.718426416
AGE-RAGE signaling pathway in diabetic complications	-0.770924710
Alanine, aspartate and glutamate metabolism	-0.679975365
Aldosterone synthesis and secretion	-0.284833004
Aldosterone-regulated sodium reabsorption	0.447895281
Allograft rejection	0.026767358
alpha-Linolenic acid metabolism	-0.602966478
Alzheimer's disease	4.330464021
Amino sugar and nucleotide sugar metabolism	0.117894488
Aminoacyl-tRNA biosynthesis	2.052738724
Amoebiasis	-0.638074336
Amphetamine addiction	-0.030753004
AMPK signaling pathway	2.521822994
Amyotrophic lateral sclerosis (ALS)	1.564938759
Antifolate resistance	-0.624940664
Antigen processing and presentation	0.875013395
Apelin signaling pathway	-0.641198625
Apoptosis	7.171447128
Arachidonic acid metabolism	-0.463075757
Arginine and proline metabolism	-0.488941807
Arginine biosynthesis	-0.439193308
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	6.881232227

Ascorbate and aldarate metabolism	-0.338779673
Asthma	-0.468660793
Autoimmune thyroid disease	-0.595202453
Autophagy - animal	3.004450351
Autophagy - other	0.052785874
B cell receptor signaling pathway	-0.576243231
Bacterial invasion of epithelial cells	-0.211207547
Basal cell carcinoma	0.305698936
beta-Alanine metabolism	0.012835243
Bile secretion	-0.317786547
Biosynthesis of unsaturated fatty acids	1.593415582
Biotin metabolism	-0.347779783
Bladder cancer	1.040475646
Breast cancer	3.592102687
Butanoate metabolism	-0.512715376
Caffeine metabolism	-0.393141410
Carbohydrate digestion and absorption	-0.281067852
Cardiac muscle contraction	-0.389773532
Cell adhesion molecules (CAMs)	-0.111731471
Cell cycle	4.394476816
Central carbon metabolism in cancer	1.908587898
Chagas disease (American trypanosomiasis)	-0.284211348
Chemical carcinogenesis	-0.365323517
Choline metabolism in cancer	2.243442465
Cholinergic synapse	-0.880654779
Chronic myeloid leukemia	0.565428363
Circadian entrainment	-0.686344202
Circadian rhythm	-0.621934038
Citrate cycle (TCA cycle)	5.978714968
Cocaine addiction	-0.377654865
Colorectal cancer	2.591687352
Complement and coagulation cascades	-0.011822412
Cysteine and methionine metabolism	0.523156927
Cytosolic DNA-sensing pathway	-0.194059610
D-Glutamine and D-glutamate metabolism	-0.129839100
Dilated cardiomyopathy	-0.711860526
Dopaminergic synapse	-0.779585081
Dorso-ventral axis formation	0.275785678
Drug metabolism - cytochrome P450	-0.601370022
Drug metabolism - other enzymes	0.178812381
ECM-receptor interaction	6.544624255
EGFR tyrosine kinase inhibitor resistance	5.361863934
Endocrine and other factor-regulated calcium reabsorption	-0.580746764
Endocrine resistance	2.042410176
Endocytosis	0.225558658
Endometrial cancer	1.637400585

Epithelial cell signaling in Helicobacter pylori infection	-0.253756287
Epstein-Barr virus infection	-0.486440848
ErbB signaling pathway	1.229810441
Estrogen signaling pathway	-0.112357268
Ether lipid metabolism	-0.019128361
Fanconi anemia pathway	0.193248117
Fat digestion and absorption	1.641720006
Fatty acid biosynthesis	31.209800505
Fatty acid degradation	-0.224156588
Fatty acid elongation	-0.465364329
Fc epsilon RI signaling pathway	-0.191733016
Fc gamma R-mediated phagocytosis	-0.227755833
Ferroptosis	0.144706841
Fluid shear stress and atherosclerosis	3.287115223
Folate biosynthesis	7.681589596
FoxO signaling pathway	1.195452776
Fructose and mannose metabolism	7.017387625
GABAergic synapse	-0.771582402
Galactose metabolism	3.606177686
Gap junction	-0.234077257
Gastric acid secretion	-0.354135048
Glioma	3.057466851
Glucagon signaling pathway	-0.402182673
Glutamatergic synapse	-0.929089563
Glutathione metabolism	0.970981085
Glycerolipid metabolism	0.617433191
Glycerophospholipid metabolism	1.658067610
Glycine, serine and threonine metabolism	0.234691188
Glycolysis / Gluconeogenesis	2.536427141
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	3.167712451
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	-0.346537233
Glycosaminoglycan degradation	1.934554184
Glycosphingolipid biosynthesis - ganglio series	0.206540879
Glycosphingolipid biosynthesis - globo and isoglobo series	-0.325572111
Glycosphingolipid biosynthesis - lacto and neolacto series	-0.294277377
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	1.482725589
Glyoxylate and dicarboxylate metabolism	0.459669973
GnRH signaling pathway	0.076007449
Graft-versus-host disease	0.270779813
Hedgehog signaling pathway	-0.489110379
Hepatitis B	1.048136770
Hepatitis C	1.587775861
Herpes simplex infection	1.023679719
HIF-1 signaling pathway	2.260662219
Hippo signaling pathway -multiple species	-0.468021540
Histidine metabolism	-0.297528881

Homologous recombination	-0.098505730
Huntington's disease	2.681234086
Hypertrophic cardiomyopathy (HCM)	-0.356938906
IL-17 signaling pathway	-0.745425962
Inflammatory bowel disease (IBD)	-0.821500171
Inflammatory mediator regulation of TRP channels	-0.489696988
Influenza A	0.132289961
Inositol phosphate metabolism	-0.454799148
Insulin resistance	0.240827195
Insulin secretion	-0.506899530
Insulin signaling pathway	1.951843833
Intestinal immune network for IgA production	-1.033417127
Legionellosis	0.098479146
Leishmaniasis	-0.085972766
Leukocyte transendothelial migration	-0.239638110
Linoleic acid metabolism	-0.638932609
Lipoic acid metabolism	-0.341897077
Long-term depression	-0.324621182
Long-term potentiation	-0.253295306
Longevity regulating pathway	-0.636051469
Longevity regulating pathway - multiple species	-0.262907697
Lysine biosynthesis	-0.202083187
Lysine degradation	-0.682331216
Malaria	-0.418430193
Mannose type O-glycan biosynthesis	0.046096123
Maturity onset diabetes of the young	-0.653537098
Measles	0.005171688
Melanogenesis	-0.321376985
Melanoma	0.839231534
Metabolism of xenobiotics by cytochrome P450	-0.666684709
Mineral absorption	-0.449962316
Mitophagy - animal	-0.100844108
Morphine addiction	-0.697151281
mRNA surveillance pathway	2.160374651
mTOR signaling pathway	1.606057368
Mucin type O-glycan biosynthesis	-0.511005213
N-Glycan biosynthesis	-0.344760732
Natural killer cell mediated cytotoxicity	-0.035025723
Neuroactive ligand-receptor interaction	-0.515630160
Neurotrophin signaling pathway	0.326100365
NF-kappa B signaling pathway	-0.564296446
Nicotinate and nicotinamide metabolism	0.019944250
Nitrogen metabolism	-0.356194581
NOD-like receptor signaling pathway	-0.131890020
Non-alcoholic fatty liver disease (NAFLD)	0.005985769
Non-small cell lung cancer	1.844780587

Notch signaling pathway	0.182864787
One carbon pool by folate	0.239371034
Oocyte meiosis	1.283844604
Osteoclast differentiation	-0.300918994
Ovarian steroidogenesis	-0.447237110
Oxidative phosphorylation	3.862627136
p53 signaling pathway	-0.210482312
Pancreatic cancer	1.882972732
Pancreatic secretion	-0.374637456
Pantothenate and CoA biosynthesis	0.209400375
Parkinson's disease	0.610335358
Pathogenic Escherichia coli infection	0.448906230
Pentose and glucuronate interconversions	-0.233512260
Pentose phosphate pathway	13.226191930
Peroxisome	0.558712594
Pertussis	-0.249813461
Phagosome	-0.031466897
Phenylalanine metabolism	0.763670924
Phenylalanine, tyrosine and tryptophan biosynthesis	-0.349404798
Phosphatidylinositol signaling system	-0.309490603
Phospholipase D signaling pathway	-0.170097469
Phosphonate and phosphinate metabolism	-0.251785908
Phototransduction	-0.692172999
Platelet activation	-0.727090794
Platinum drug resistance	-0.139607842
Porphyrin and chlorophyll metabolism	-0.437159435
Primary bile acid biosynthesis	-0.518628309
Prion diseases	1.094727733
Progesterone-mediated oocyte maturation	0.370764436
Prolactin signaling pathway	0.101858229
Propanoate metabolism	-0.148298084
Prostate cancer	2.782293906
Protein processing in endoplasmic reticulum	1.778678221
Proximal tubule bicarbonate reclamation	-0.215287494
Pyrimidine metabolism	-0.423304715
Pyruvate metabolism	2.600913366
Regulation of lipolysis in adipocytes	-0.499457917
Renal cell carcinoma	0.787939459
Renin secretion	-0.277961273
Renin-angiotensin system	-0.364183727
Retinol metabolism	-0.716628555
Retrograde endocannabinoid signaling	-0.721465115
Rheumatoid arthritis	-0.615916065
Riboflavin metabolism	0.629141467
Ribosome biogenesis in eukaryotes	-0.366570161
RIG-I-like receptor signaling pathway	0.748397543

RNA degradation	-0.084008355
RNA transport	2.938696331
Salivary secretion	-0.520558361
Salmonella infection	1.212258552
Selenocompound metabolism	-0.086182352
Serotonergic synapse	-0.925192261
Shigellosis	-0.736324955
Signaling pathways regulating pluripotency of stem cells	0.127939078
Small cell lung cancer	12.118429801
SNARE interactions in vesicular transport	-0.706155750
Sphingolipid metabolism	-0.202424605
Sphingolipid signaling pathway	-0.204853889
Staphylococcus aureus infection	0.384805807
Starch and sucrose metabolism	0.298955655
Steroid biosynthesis	-0.461065768
Steroid hormone biosynthesis	-0.701718023
Sulfur metabolism	-0.413477036
Sulfur relay system	-0.387905448
Synaptic vesicle cycle	4.171182296
Synthesis and degradation of ketone bodies	-0.269476437
Systemic lupus erythematosus	-0.054485796
T cell receptor signaling pathway	-0.694218723
Taste transduction	-0.501538900
Taurine and hypotaurine metabolism	-0.431508969
Terpenoid backbone biosynthesis	-0.109984739
TGF-beta signaling pathway	2.950412855
Th1 and Th2 cell differentiation	-0.511752034
Th17 cell differentiation	0.038451978
Thiamine metabolism	2.330540547
Thyroid cancer	3.044598431
Thyroid hormone signaling pathway	0.013214107
Thyroid hormone synthesis	-0.533826832
Tight junction	-0.006652315
TNF signaling pathway	-0.197980508
Toll-like receptor signaling pathway	-0.953716197
Toxoplasmosis	3.647732157
Transcriptional misregulation in cancer	-0.267237926
Tryptophan metabolism	-0.288513117
Type I diabetes mellitus	-0.462848661
Type II diabetes mellitus	-0.485726678
Tyrosine metabolism	-0.267753974
Ubiquinone and other terpenoid-quinone biosynthesis	0.117499010
Valine, leucine and isoleucine degradation	-0.581540139
Vascular smooth muscle contraction	-0.572369318
Vasopressin-regulated water reabsorption	-0.359762108
VEGF signaling pathway	-0.390205836

Vibrio cholerae infection	-0.605789239
Viral carcinogenesis	-0.238707024
Viral myocarditis	0.362211037
Vitamin B6 metabolism	-0.238897551
Vitamin digestion and absorption	-0.446155103
Wnt signaling pathway	0.041529335
	p.value
Acute myeloid leukemia	0.18
Adherens junction	0.02
Adipocytokine signaling pathway	0.30
Adrenergic signaling in cardiomyocytes	0.75
African trypanosomiasis	0.99
AGE-RAGE signaling pathway in diabetic complications	0.90
Alanine, aspartate and glutamate metabolism	0.82
Aldosterone synthesis and secretion	0.44
Aldosterone-regulated sodium reabsorption	0.10
Allograft rejection	0.27
alpha-Linolenic acid metabolism	0.78
Alzheimer's disease	0.02
Amino sugar and nucleotide sugar metabolism	0.26
Aminoacyl-tRNA biosynthesis	0.05
Amoebiasis	0.86
Amphetamine addiction	0.35
AMPK signaling pathway	0.02
Amyotrophic lateral sclerosis (ALS)	0.09
Antifolate resistance	0.87
Antigen processing and presentation	0.09
Apelin signaling pathway	0.78
Apoptosis	0.00
Arachidonic acid metabolism	0.76
Arginine and proline metabolism	0.80
Arginine biosynthesis	0.77
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.00
Ascorbate and aldarate metabolism	1.00
Asthma	1.00
Autoimmune thyroid disease	1.00
Autophagy - animal	0.02
Autophagy - other	0.34
B cell receptor signaling pathway	0.70
Bacterial invasion of epithelial cells	0.42
Basal cell carcinoma	0.19
beta-Alanine metabolism	0.30
Bile secretion	0.85
Biosynthesis of unsaturated fatty acids	0.10
Biotin metabolism	1.00
Bladder cancer	0.09

Breast cancer	0.02
Butanoate metabolism	0.68
Caffeine metabolism	0.69
Carbohydrate digestion and absorption	0.44
Cardiac muscle contraction	0.46
Cell adhesion molecules (CAMs)	0.34
Cell cycle	0.01
Central carbon metabolism in cancer	0.06
Chagas disease (American trypanosomiasis)	0.49
Chemical carcinogenesis	0.51
Choline metabolism in cancer	0.02
Cholinergic synapse	0.91
Chronic myeloid leukemia	0.21
Circadian entrainment	0.79
Circadian rhythm	0.83
Citrate cycle (TCA cycle)	0.01
Cocaine addiction	0.84
Colorectal cancer	0.04
Complement and coagulation cascades	0.34
Cysteine and methionine metabolism	0.10
Cytosolic DNA-sensing pathway	0.43
D-Glutamine and D-glutamate metabolism	0.26
Dilated cardiomyopathy	0.83
Dopaminergic synapse	0.93
Dorso-ventral axis formation	0.13
Drug metabolism - cytochrome P450	0.77
Drug metabolism - other enzymes	0.19
ECM-receptor interaction	0.00
EGFR tyrosine kinase inhibitor resistance	0.00
Endocrine and other factor-regulated calcium reabsorption	0.74
Endocrine resistance	0.05
Endocytosis	0.19
Endometrial cancer	0.04
Epithelial cell signaling in Helicobacter pylori infection	0.46
Epstein-Barr virus infection	0.61
ErbB signaling pathway	0.09
Estrogen signaling pathway	0.35
Ether lipid metabolism	0.42
Fanconi anemia pathway	0.21
Fat digestion and absorption	0.09
Fatty acid biosynthesis	0.00
Fatty acid degradation	0.43
Fatty acid elongation	0.56
Fc epsilon RI signaling pathway	0.39
Fc gamma R-mediated phagocytosis	0.40
Ferroptosis	0.16

Fluid shear stress and atherosclerosis	0.01
Folate biosynthesis	0.00
FoxO signaling pathway	0.09
Fructose and mannose metabolism	0.00
GABAergic synapse	0.98
Galactose metabolism	0.01
Gap junction	0.37
Gastric acid secretion	0.58
Glioma	0.02
Glucagon signaling pathway	0.54
Glutamatergic synapse	1.00
Glutathione metabolism	0.09
Glycerolipid metabolism	0.07
Glycerophospholipid metabolism	0.02
Glycine, serine and threonine metabolism	0.15
Glycolysis / Gluconeogenesis	0.01
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.02
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.54
Glycosaminoglycan degradation	0.04
Glycosphingolipid biosynthesis - ganglio series	0.19
Glycosphingolipid biosynthesis - globo and isoglobo series	0.52
Glycosphingolipid biosynthesis - lacto and neolacto series	0.89
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.06
Glyoxylate and dicarboxylate metabolism	0.05
GnRH signaling pathway	0.30
Graft-versus-host disease	0.18
Hedgehog signaling pathway	0.63
Hepatitis B	0.14
Hepatitis C	0.03
Herpes simplex infection	0.17
HIF-1 signaling pathway	0.03
Hippo signaling pathway -multiple species	0.76
Histidine metabolism	0.66
Homologous recombination	0.37
Huntington's disease	0.03
Hypertrophic cardiomyopathy (HCM)	0.53
IL-17 signaling pathway	0.87
Inflammatory bowel disease (IBD)	0.95
Inflammatory mediator regulation of TRP channels	0.78
Influenza A	0.28
Inositol phosphate metabolism	0.81
Insulin resistance	0.24
Insulin secretion	0.74
Insulin signaling pathway	0.02
Intestinal immune network for IgA production	1.00
Legionellosis	0.22

Leishmaniasis	0.37
Leukocyte transendothelial migration	0.81
Linoleic acid metabolism	0.91
Lipoic acid metabolism	0.68
Long-term depression	0.53
Long-term potentiation	0.48
Longevity regulating pathway	0.70
Longevity regulating pathway - multiple species	0.47
Lysine biosynthesis	0.35
Lysine degradation	0.80
Malaria	0.96
Mannose type O-glycan biosynthesis	0.12
Maturity onset diabetes of the young	0.99
Measles	0.34
Melanogenesis	0.52
Melanoma	0.15
Metabolism of xenobiotics by cytochrome P450	0.76
Mineral absorption	0.56
Mitophagy - animal	0.28
Morphine addiction	1.00
mRNA surveillance pathway	0.05
mTOR signaling pathway	0.06
Mucin type O-glycan biosynthesis	0.72
N-Glycan biosynthesis	0.53
Natural killer cell mediated cytotoxicity	0.32
Neuroactive ligand-receptor interaction	0.92
Neurotrophin signaling pathway	0.24
NF-kappa B signaling pathway	0.68
Nicotinate and nicotinamide metabolism	0.23
Nitrogen metabolism	0.47
NOD-like receptor signaling pathway	0.38
Non-alcoholic fatty liver disease (NAFLD)	0.36
Non-small cell lung cancer	0.07
Notch signaling pathway	0.29
One carbon pool by folate	0.18
Oocyte meiosis	0.04
Osteoclast differentiation	0.52
Ovarian steroidogenesis	0.66
Oxidative phosphorylation	0.01
p53 signaling pathway	0.49
Pancreatic cancer	0.06
Pancreatic secretion	0.61
Pantothenate and CoA biosynthesis	0.22
Parkinson's disease	0.10
Pathogenic Escherichia coli infection	0.17
Pentose and glucuronate interconversions	0.50

Pentose phosphate pathway	0.00
Peroxisome	0.15
Pertussis	0.48
Phagosome	0.35
Phenylalanine metabolism	0.14
Phenylalanine, tyrosine and tryptophan biosynthesis	0.41
Phosphatidylinositol signaling system	0.54
Phospholipase D signaling pathway	0.43
Phosphonate and phosphinate metabolism	0.44
Phototransduction	0.95
Platelet activation	0.95
Platinum drug resistance	0.36
Porphyrin and chlorophyll metabolism	0.94
Primary bile acid biosynthesis	0.81
Prion diseases	0.06
Progesterone-mediated oocyte maturation	0.13
Prolactin signaling pathway	0.23
Propanoate metabolism	0.41
Prostate cancer	0.02
Protein processing in endoplasmic reticulum	0.05
Proximal tubule bicarbonate reclamation	0.37
Pyrimidine metabolism	0.61
Pyruvate metabolism	0.02
Regulation of lipolysis in adipocytes	0.81
Renal cell carcinoma	0.08
Renin secretion	0.47
Renin-angiotensin system	1.00
Retinol metabolism	0.84
Retrograde endocannabinoid signaling	1.00
Rheumatoid arthritis	0.95
Riboflavin metabolism	0.15
Ribosome biogenesis in eukaryotes	0.53
RIG-I-like receptor signaling pathway	0.15
RNA degradation	0.23
RNA transport	0.02
Salivary secretion	0.74
Salmonella infection	0.07
Selenocompound metabolism	0.31
Serotonergic synapse	0.98
Shigellosis	0.88
Signaling pathways regulating pluripotency of stem cells	0.29
Small cell lung cancer	0.00
SNARE interactions in vesicular transport	0.84
Sphingolipid metabolism	0.42
Sphingolipid signaling pathway	0.42
Staphylococcus aureus infection	0.21

Starch and sucrose metabolism	0.07
Steroid biosynthesis	0.91
Steroid hormone biosynthesis	0.96
Sulfur metabolism	0.62
Sulfur relay system	0.68
Synaptic vesicle cycle	0.02
Synthesis and degradation of ketone bodies	0.43
Systemic lupus erythematosus	0.34
T cell receptor signaling pathway	0.80
Taste transduction	0.58
Taurine and hypotaurine metabolism	0.61
Terpenoid backbone biosynthesis	0.37
TGF-beta signaling pathway	0.01
Th1 and Th2 cell differentiation	0.63
Th17 cell differentiation	0.29
Thiamine metabolism	0.04
Thyroid cancer	0.03
Thyroid hormone signaling pathway	0.34
Thyroid hormone synthesis	0.77
Tight junction	0.28
TNF signaling pathway	0.41
Toll-like receptor signaling pathway	0.89
Toxoplasmosis	0.02
Transcriptional misregulation in cancer	0.60
Tryptophan metabolism	0.46
Type I diabetes mellitus	1.00
Type II diabetes mellitus	0.61
Tyrosine metabolism	0.42
Ubiquinone and other terpenoid-quinone biosynthesis	0.24
Valine, leucine and isoleucine degradation	0.82
Vascular smooth muscle contraction	0.70
Vasopressin-regulated water reabsorption	0.53
VEGF signaling pathway	0.63
Vibrio cholerae infection	0.94
Viral carcinogenesis	0.42
Viral myocarditis	0.25
Vitamin B6 metabolism	0.38
Vitamin digestion and absorption	1.00
Wnt signaling pathway	0.31

	q.value
Acute myeloid leukemia	0.5751220
Adherens junction	0.1690323
Adipocytokine signaling pathway	0.7145455
Adrenergic signaling in cardiomyocytes	0.9685308
African trypanosomiasis	1.0000000
AGE-RAGE signaling pathway in diabetic complications	1.0000000

Alanine, aspartate and glutamate metabolism	0.9721267
Aldosterone synthesis and secretion	0.7685333
Aldosterone-regulated sodium reabsorption	0.3969697
Allograft rejection	0.7003960
alpha-Linolenic acid metabolism	0.9685308
Alzheimer's disease	0.1690323
Amino sugar and nucleotide sugar metabolism	0.6812000
Aminoacyl-tRNA biosynthesis	0.2911111
Amoebiasis	0.9882456
Amphetamine addiction	0.7455285
AMPK signaling pathway	0.1690323
Amyotrophic lateral sclerosis (ALS)	0.3803226
Antifolate resistance	0.9910435
Antigen processing and presentation	0.3803226
Apelin signaling pathway	0.9685308
Apoptosis	0.0000000
Arachidonic acid metabolism	0.9685308
Arginine and proline metabolism	0.9690411
Arginine biosynthesis	0.9685308
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	0.0000000
Ascorbate and aldarate metabolism	1.0000000
Asthma	1.0000000
Autoimmune thyroid disease	1.0000000
Autophagy - animal	0.1690323
Autophagy - other	0.7455285
B cell receptor signaling pathway	0.9309645
Bacterial invasion of epithelial cells	0.7663946
Basal cell carcinoma	0.5788372
beta-Alanine metabolism	0.7145455
Bile secretion	0.9810573
Biosynthesis of unsaturated fatty acids	0.3969697
Biotin metabolism	1.0000000
Bladder cancer	0.3803226
Breast cancer	0.1690323
Butanoate metabolism	0.9231088
Caffeine metabolism	0.9309645
Carbohydrate digestion and absorption	0.7685333
Cardiac muscle contraction	0.7877124
Cell adhesion molecules (CAMs)	0.7455285
Cell cycle	0.1637500
Central carbon metabolism in cancer	0.3144000
Chagas disease (American trypanosomiasis)	0.8023750
Chemical carcinogenesis	0.8168235
Choline metabolism in cancer	0.1690323
Cholinergic synapse	1.0000000
Chronic myeloid leukemia	0.6182022

Circadian entrainment	0.9690411
Circadian rhythm	0.9738053
Citrate cycle (TCA cycle)	0.1637500
Cocaine addiction	0.9738053
Colorectal cancer	0.2620000
Complement and coagulation cascades	0.7455285
Cysteine and methionine metabolism	0.3969697
Cytosolic DNA-sensing pathway	0.7663946
D-Glutamine and D-glutamate metabolism	0.6812000
Dilated cardiomyopathy	0.9738053
Dopaminergic synapse	1.0000000
Dorso-ventral axis formation	0.4936232
Drug metabolism - cytochrome P450	0.9685308
Drug metabolism - other enzymes	0.5788372
ECM-receptor interaction	0.0000000
EGFR tyrosine kinase inhibitor resistance	0.0000000
Endocrine and other factor-regulated calcium reabsorption	0.9645771
Endocrine resistance	0.2911111
Endocytosis	0.5788372
Endometrial cancer	0.2620000
Epithelial cell signaling in Helicobacter pylori infection	0.7877124
Epstein-Barr virus infection	0.8733333
ErbB signaling pathway	0.3803226
Estrogen signaling pathway	0.7455285
Ether lipid metabolism	0.7663946
Fanconi anemia pathway	0.6182022
Fat digestion and absorption	0.3803226
Fatty acid biosynthesis	0.0000000
Fatty acid degradation	0.7663946
Fatty acid elongation	0.8384000
Fc epsilon RI signaling pathway	0.7663946
Fc gamma R-mediated phagocytosis	0.7663946
Ferroptosis	0.5444156
Fluid shear stress and atherosclerosis	0.1637500
Folate biosynthesis	0.0000000
FoxO signaling pathway	0.3803226
Fructose and mannose metabolism	0.0000000
GABAergic synapse	1.0000000
Galactose metabolism	0.1637500
Gap junction	0.7456923
Gastric acid secretion	0.8585311
Glioma	0.1690323
Glucagon signaling pathway	0.8178035
Glutamatergic synapse	1.0000000
Glutathione metabolism	0.3803226
Glycerolipid metabolism	0.3396296

Glycerophospholipid metabolism	0.1690323
Glycine, serine and threonine metabolism	0.5171053
Glycolysis / Gluconeogenesis	0.1637500
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	0.1690323
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	0.8178035
Glycosaminoglycan degradation	0.2620000
Glycosphingolipid biosynthesis - ganglio series	0.5788372
Glycosphingolipid biosynthesis - globo and isoglobo series	0.8168235
Glycosphingolipid biosynthesis - lacto and neolacto series	1.0000000
Glycosylphosphatidylinositol (GPI)-anchor biosynthesis	0.3144000
Glyoxylate and dicarboxylate metabolism	0.2911111
GnRH signaling pathway	0.7145455
Graft-versus-host disease	0.5751220
Hedgehog signaling pathway	0.8826738
Hepatitis B	0.5166197
Hepatitis C	0.2245714
Herpes simplex infection	0.5637975
HIF-1 signaling pathway	0.2245714
Hippo signaling pathway -multiple species	0.9685308
Histidine metabolism	0.9149206
Homologous recombination	0.7456923
Huntington's disease	0.2245714
Hypertrophic cardiomyopathy (HCM)	0.8168235
IL-17 signaling pathway	0.9910435
Inflammatory bowel disease (IBD)	1.0000000
Inflammatory mediator regulation of TRP channels	0.9685308
Influenza A	0.7053846
Inositol phosphate metabolism	0.9690411
Insulin resistance	0.6482474
Insulin secretion	0.9645771
Insulin signaling pathway	0.1690323
Intestinal immune network for IgA production	1.0000000
Legionellosis	0.6334066
Leishmaniasis	0.7456923
Leukocyte transendothelial migration	0.9690411
Linoleic acid metabolism	1.0000000
Lipoic acid metabolism	0.9231088
Long-term depression	0.8168235
Long-term potentiation	0.7959494
Longevity regulating pathway	0.9309645
Longevity regulating pathway - multiple species	0.7893590
Lysine biosynthesis	0.7455285
Lysine degradation	0.9690411
Malaria	1.0000000
Mannose type O-glycan biosynthesis	0.4692537
Maturity onset diabetes of the young	1.0000000

Measles	0.7455285
Melanogenesis	0.8168235
Melanoma	0.5171053
Metabolism of xenobiotics by cytochrome P450	0.9685308
Mineral absorption	0.8384000
Mitophagy - animal	0.7053846
Morphine addiction	1.0000000
mRNA surveillance pathway	0.2911111
mTOR signaling pathway	0.3144000
Mucin type O-glycan biosynthesis	0.9527273
N-Glycan biosynthesis	0.8168235
Natural killer cell mediated cytotoxicity	0.7419469
Neuroactive ligand-receptor interaction	1.0000000
Neurotrophin signaling pathway	0.6482474
NF-kappa B signaling pathway	0.9231088
Nicotinate and nicotinamide metabolism	0.6410638
Nitrogen metabolism	0.7893590
NOD-like receptor signaling pathway	0.7542424
Non-alcoholic fatty liver disease (NAFLD)	0.7456923
Non-small cell lung cancer	0.3396296
Notch signaling pathway	0.7100935
One carbon pool by folate	0.5751220
Oocyte meiosis	0.2620000
Osteoclast differentiation	0.8168235
Ovarian steroidogenesis	0.9149206
Oxidative phosphorylation	0.1637500
p53 signaling pathway	0.8023750
Pancreatic cancer	0.3144000
Pancreatic secretion	0.8733333
Pantothenate and CoA biosynthesis	0.6334066
Parkinson's disease	0.3969697
Pathogenic Escherichia coli infection	0.5637975
Pentose and glucuronate interconversions	0.8136646
Pentose phosphate pathway	0.0000000
Peroxisome	0.5171053
Pertussis	0.7959494
Phagosome	0.7455285
Phenylalanine metabolism	0.5166197
Phenylalanine, tyrosine and tryptophan biosynthesis	0.7663946
Phosphatidylinositol signaling system	0.8178035
Phospholipase D signaling pathway	0.7663946
Phosphonate and phosphinate metabolism	0.7685333
Phototransduction	1.0000000
Platelet activation	1.0000000
Platinum drug resistance	0.7456923
Porphyrin and chlorophyll metabolism	1.0000000

Primary bile acid biosynthesis	0.9690411
Prion diseases	0.3144000
Progesterone-mediated oocyte maturation	0.4936232
Prolactin signaling pathway	0.6410638
Propanoate metabolism	0.7663946
Prostate cancer	0.1690323
Protein processing in endoplasmic reticulum	0.2911111
Proximal tubule bicarbonate reclamation	0.7456923
Pyrimidine metabolism	0.8733333
Pyruvate metabolism	0.1690323
Regulation of lipolysis in adipocytes	0.9690411
Renal cell carcinoma	0.3803226
Renin secretion	0.7893590
Renin-angiotensin system	1.0000000
Retinol metabolism	0.9738053
Retrograde endocannabinoid signaling	1.0000000
Rheumatoid arthritis	1.0000000
Riboflavin metabolism	0.5171053
Ribosome biogenesis in eukaryotes	0.8168235
RIG-I-like receptor signaling pathway	0.5171053
RNA degradation	0.6410638
RNA transport	0.1690323
Salivary secretion	0.9645771
Salmonella infection	0.3396296
Selenocompound metabolism	0.7251786
Serotonergic synapse	1.0000000
Shigellosis	0.9980952
Signaling pathways regulating pluripotency of stem cells	0.7100935
Small cell lung cancer	0.0000000
SNARE interactions in vesicular transport	0.9738053
Sphingolipid metabolism	0.7663946
Sphingolipid signaling pathway	0.7663946
Staphylococcus aureus infection	0.6182022
Starch and sucrose metabolism	0.3396296
Steroid biosynthesis	1.0000000
Steroid hormone biosynthesis	1.0000000
Sulfur metabolism	0.8826738
Sulfur relay system	0.9231088
Synaptic vesicle cycle	0.1690323
Synthesis and degradation of ketone bodies	0.7663946
Systemic lupus erythematosus	0.7455285
T cell receptor signaling pathway	0.9690411
Taste transduction	0.8585311
Taurine and hypotaurine metabolism	0.8733333
Terpenoid backbone biosynthesis	0.7456923
TGF-beta signaling pathway	0.1637500

```
Th1 and Th2 cell differentiation                                0.8826738
Th17 cell differentiation                                       0.7100935
Thiamine metabolism                                             0.2620000
Thyroid cancer                                                  0.2245714
Thyroid hormone signaling pathway                               0.7455285
Thyroid hormone synthesis                                       0.9685308
Tight junction                                                  0.7053846
TNF signaling pathway                                           0.7663946
Toll-like receptor signaling pathway                            1.0000000
Toxoplasmosis                                                   0.1690323
Transcriptional misregulation in cancer                         0.8733333
Tryptophan metabolism                                           0.7877124
Type I diabetes mellitus                                        1.0000000
Type II diabetes mellitus                                       0.8733333
Tyrosine metabolism                                             0.7663946
Ubiquinone and other terpenoid-quinone biosynthesis             0.6482474
Valine, leucine and isoleucine degradation                      0.9721267
Vascular smooth muscle contraction                              0.9309645
Vasopressin-regulated water reabsorption                        0.8168235
VEGF signaling pathway                                          0.8826738
Vibrio cholerae infection                                       1.0000000
Viral carcinogenesis                                            0.7663946
Viral myocarditis                                               0.6683673
Vitamin B6 metabolism                                           0.7542424
Vitamin digestion and absorption                                1.0000000
Wnt signaling pathway                                           0.7251786

$errors
named list()
```

Arguments of this functions are almost the same as in `SPIA`. Apart from the expected arguments: a gene expression data matrix, a vector of class labels and a list of pathways, the user needs to specify the `type` argument which decides on the type of the data (`"MA"` is used for expression microarray and `"RNASeq"` for RNA-Seq data). Alternatively, the user can supply the results of the differential expression analysis of genes in two forms:

1. a data.frame with columns: *ID* gene identifiers (they must match with the node labels), *logFC* log fold-changes, *t* - t-statistics, *pval* p-values, *padj* adjusted p-values. Then the user sets `type` to `DEtable`
2. a list with two slots: named vector of log fold-changes of differentially expressed genes and a vector of names of all genes analysed. Then the user sets `type` to `DElist`

The others arguments are optional. Arguments `convertTo` and `convertBy` control the conversion of the node labels in the pathways. The default setting

is `convertTo="none"` which performs no conversion. Please note, that the node labels should be the same as the rownames of gene expression data matrix. The default thresholds for the differential expression analysis of genes (the moderated t-test from `limma` is used) are set with arguments `logFC.th` and `p.val.th`. The user can omit one of these criteria by setting the agrument negative value, as is shown also in the example. The implementation returns also a gene-level statistics of the differential expression of genes. These statistics are later used in the visualization of a selected pathway. There is one extra argument `nperm` which controls the number of permutations.

3.7 PWEA

The last method available in this package is called PathWay Enrichment Analysis (PWEA). This is actually a weigthed form of common Gene Set Enrichment Analysis (GSEA). The weights are called Topological Influence Factor (TIF) and are defined as a geometic mean of ratios of Pearson's correlation coefficient and the distance of two genes in a pathway. The weights of genes outside a pathway are assigned randomly from normal distribution with parameters estimated from the weights of genes in all pathways. A statistical significance of a pathway is assessed via Kolmogorov-Simirnov-like test statistic comparing two cumulative distribution functions with class label permutations.

```
> pwe<-PWEA(hnrnp.cnts, group, pathways, type="RNASeq", nperm=100)
> #528 node labels mapped to the expression data
> #Average coverage 83.16538
> #0 (out of 10) pathways without a mapped node
> #Acute myeloid leukemia
> #Adherens junction
> #Adipocytokine signaling pathway
> #Adrenergic signaling in cardiomyocytes
> #African trypanosomiasis
> #Alanine, aspartate and glutamate metabolism
> #Alcoholism
> #Aldosterone-regulated sodium reabsorption
> #Allograft rejection
> #alpha-Linolenic acid metabolism
> res(pwe)
> #                                                ES    p     p.adj
> #Acute myeloid leukemia                    0.3526104 0.29 0.4142857
> #Adherens junction                         0.3829831 1.00 1.0000000
> #Adipocytokine signaling pathway           0.3102945 1.00 1.0000000
> #Adrenergic signaling in cardiomyocytes    0.3611207 0.20 0.3333333
> #African trypanosomiasis                   0.3272899 0.20 0.3333333
> #Alanine, aspartate and glutamate metabolism 0.2720946 0.20 0.3333333
> #Alcoholism                                0.4708293 0.86 1.0000000
```

```
> #Aldosterone-regulated sodium reabsorption   0.3951037 0.20 0.3333333
> #Allograft rejection                        0.9421248 0.03 0.3000000
> #alpha-Linolenic acid metabolism            0.6587026 0.20 0.3333333
```

Apart from the expected arguments: a gene expression data matrix, a vector of class labels and a list of pathways, the user needs to specify the `type` argument which decides on the type of the data (`"MA"` is used for expression microarray and `"RNASeq"` for RNA-Seq data). The others arguments are optional.Arguments `convertTo` and `convertBy` control the conversion of the node labels in the pathways. The default setting is `convertTo="none"` which performs no conversion. Please note, that the node labels should be the same as the rownames of gene expression data matrix. The `alpha` parameter sets a threshold for gene weights. The purpose of this filtering is to reduce the possiblity that a weight of a gene that is tighly correlated with a few genes are lowered by the weak correlation with other genes in a pathway. The implementation returns also a gene-level statistics of the differential expression of genes. These statistics are later used in the visualization of a selected pathway. The `nperm` argument controls the number of permutations.

Chapter 4

Outputs and visualization of the results for one pathway

All the functions mentioned in this vignette return an object of class `topResult`. It is a list with three slots. The first one is called `res` and contains a data frame of the results for all the pathways. The actual informations there differ among the methods and are described in the manual. The second slot is called `topo.sig` and it is a list of topological significances of genes in pathways. The term topologial significance means scores used to measure the importance of a gene in a pathway. The higher the score the more important gene. It is `NULL` for TAPPA and DEGraph method, because they do not provide any measure of this kind. The last slot contains the log fold-changes or test statistics of differential expression at gene level. They are necessary in the `plot` function for all the methods except TopologyGSA and clipper.

The `plot()` function has three necessarry arguments when it is to be applied on `topResult` object. The first one is an output from any of the methods. The second one is either a name of a pathway or its number in a list of pathways. And the last one is a list of pathways used in the analysis.

The final visualization of the results for one pathway is method specific. Three arguments that are common to all methods are:

- `IDs` - the type of gene labels in the original data, `"entrez"` by default
- `graphIDS` - the type of gene labels to be used in plot, `"symbol"` by default
- `layout` - the layout of the graph from `Rgraphviz` package, `"dot"` by default, other possibilities are e.g. `"neato"` or `"twopi"`

The significant cliques are enhanced in the results of TopologyGSA and clipper. Since the whole analysis with these method is done on transformed topology (moralized then triangulated graphs), the transformed topology is also drawn in the visualization. The user can specify the color which used for edges between nodes from a significant clique (default value is `cli.color="red"` and

can be either a character or a function that returns a color pallette) and the color of nodes (default value is `cli.node.color="white"`. The `alpha` controls the significance threshold for the cliques. If `add.legend=TRUE` then a legend is drawn containing the colors of edges of individual cliques, their genes and p-value. The `intersp` can be used to adjust the space between items of legened.

```
> #Fails during check
> library(gageData)
> data(hnrnp.cnts)
> group<-c(rep("sample",4), rep("control",4))
> hnrnp.cnts<-hnrnp.cnts[rowSums(hnrnp.cnts)>0,]
> res<-clipper(hnrnp.cnts, group, pathways[1:2], type="RNASeq", testCliques=TRUE)
> plot(res,1, pathways)
>
```

In the visualization of the results from PRS, PWEA or SPIA method, the nodes are colored accoring to the selected gene-level statistic and the size of node reflects the topological significance of a node. Because TAPPA and DEGraph do not provide any specific topological or statistical measure at gene-level, only the coloring of the nodes according to gene-level statistics is used. The user can specify the number of breaks for gene statistics and topological significance of genes (default values are 100 and 5, `breaks=c(100,5)`), colors in the pallete for the gene statistics (default is `pallete.colors=c("blue","white", "red")` and a color for missing nodes `na.col="grey"`. The `stats` argument controls the label of the gene statistics and `title` controls whether the name of a pathway and its p-value should be written as a title. The user can also adjust the size of the nodes (`nodesize`) and font (`fontsize`)

```
> library(gageData)
> data(hnrnp.cnts)
> group<-c(rep("sample",4), rep("control",4))
> hnrnp.cnts<-hnrnp.cnts[rowSums(hnrnp.cnts)>0,]
> pathways<-pathways("hsapiens", "kegg")[50:55]
> spi<-SPIA(hnrnp.cnts, group, pathways, type="RNASeq", logFC.th=-1)
> plot(spi,"Complement and coagulation cascades", pathways, fontsize=50)
>
```

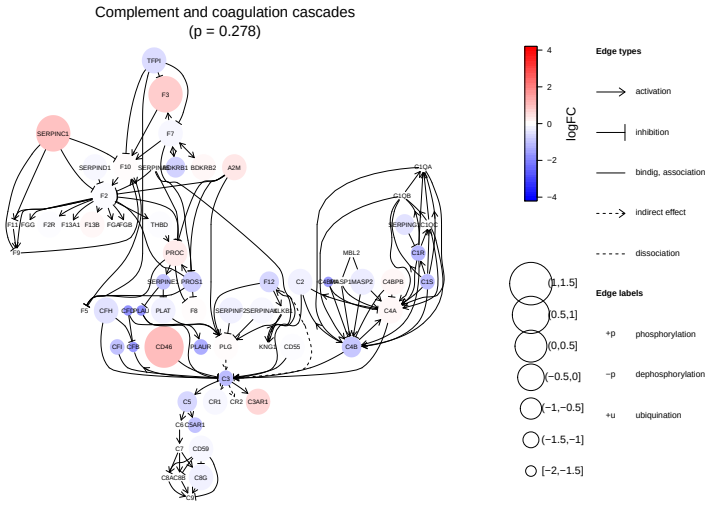
Complement and coagulation cascades
(p = 0.278)
logFC
4
2
0
−2
−4
Edge types
activation
inhibition
bindig, association
indirect effect
dissociation
Edge labels
(1,1.5]
(0.5,1]
(0,0.5]
(−0.5,0]
(−1,−0.5]
(−1.5,−1]
[−2,−1.5]
+p phosphorylation
−p dephosphorylation
+u ubiquination

Figure 4.1:

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