GutUDB: A comprehensive multiomics database for intestinal diseases

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Introduction

High-throughput sequencing:
- RNA-seq
- ChIP-seq
- scRNA-seq
- MeRIP-seq

DNA level processes
Transcriptional dynamics
Protein-related activities
Epigenetic modifications
GutUDB: A comprehensive multiomics database for intestinal diseases
FIGURE 1 (A) The process of data collection and processing, as well as the construction procedure of the database website, incorporating four core functions (browsing, querying, visualizing, and downloading).

- 8 types of omics
- 6 types of species
- 56 types of intestinal diseases
- 11 types of intestinal tissues
- 63 types of intestinal cell lines
- 58970 genes
Result: Disease-gene associations across distinct intestinal diseases

260,790 disease gene associations

Figure S1 (A) The proportion of various intestinal diseases.

Figure S1 (B) The top 10 genes associated with gene-disease.
Result: Homepage

Four modules: omics, species, diseases, therapy
Result: Overview of GutUDB

Gene Name: METTL3
Start: 21498133
RBP: Yes
RNA editing: NO
Therapeutic targets: Yes

Ensemble ID: ENSG00000165819
End: 21511342
m6A: YES
TF: Yes
Diagonal targets:

Seqnames: chr14
Strand: -
AS: NO
Motif: NA
NCBI

Gene details

FIGURE 1. (B) The expression levels of the METTL3 in different tissues. The data derived from GTEx. (C) Boxplot displaying gene expression difference between COAD and healthy tissues. $p < 0.05$ indicated that the expression of METTL3 was significantly different between the two groups. (D) Scatter plot showing the correlation analysis of METTL3 expression between COAD group and healthy group. $r = -0.02$ indicated that METTL3 expression almost no correlation between the two groups. (E) Survival analysis curve of POLE associated with COAD.
Figure S1 (D) Eight major omics information related to genes.
The therapy section contains chemical compounds, traditional medicine and probiotics.

- 6281 types of chemical compounds
- 393 types of traditional medicine
- 22 types of probiotics
Intestinal Diseases

Diseases name: All(24388) Colon Adenocarcinoma(3450) Colitis(2711) Intussusception(2606) Colorectal Neoplasms(1734)
Colonic Neoplasms(1662) Intestinal Neoplasms(1469) Inflammatory Bowel Diseases(1366) Enteritis(1308)
Duodenal Ulcer(1175) Crohn Disease(1165) Anus Neoplasms(1164) ileus(1140) Rectal Neoplasms(950) Ileitis(668)
Megacolon(522) Intestinal obstruction(483) Proctocolitis(425) Duodenal Neoplasms(390)

Omic levels: All Genomic Transcriptomic Proteomics Metabolomics Single cell omics Spatial omics Epigenomics
Microbiomics

Hot genes: All(55970) APC(9906) STK11(9471) MEN1(5750) SMAD4(5137) BMPR1A(5048) CFTR(4425) PKHD1(2886)
CDH1(2650) NOTCH1(2260) MLH1(1568) PKD1(1491) KCNT1(1446) AP3B1(1360) MSH2(1336) TP53(1236)

<table>
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<th>#</th>
<th>Disease related genes</th>
<th>Disease</th>
<th>Omics</th>
<th>Source</th>
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<tr>
<td>1</td>
<td>CCND3</td>
<td>Appendiceal Cancer</td>
<td>Genomic</td>
<td>36493333</td>
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<tr>
<td>2</td>
<td>CDKN2A</td>
<td>Appendiceal Cancer</td>
<td>Genomic</td>
<td>36493333</td>
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<tr>
<td>3</td>
<td>TERT</td>
<td>Appendiceal Cancer</td>
<td>Genomic</td>
<td>36493333</td>
</tr>
</tbody>
</table>

Figure S1 (F) Details page of the diseases section.
Figure S1 (G) Details page of the species section.
Click to view the content of each omic
Result: Browsing spatial omics and single-cell omics data of intestinal diseases

FIGURE 1. (F) The expression levels of CNPY3 in various cells and the presentation of expression maps in scRNA-seq data.
Result: Interactive visualization of bulk multiomics profiles related to intestinal diseases

FIGURE 1. (G) Tracks displaying the read coverage of H3k27me3, the m6A sites as well as RNA-seq and SNP data in colorectal cancer on the MUTYH.
Result: Interactive visualization of bulk multiomics profiles related to intestinal diseases

Summary
Project: GSE127938
Tissue/Cell line: Pylorus, Duodenum, Jejunum, ileum, Colon
PMID: 525840

Disease: Normal
Species: Homo sapiens
CASE: Pylorus organoids, Duodenum organoids, Jejunum organoids, ileum organoids, Colon organoids
Control: Corpus organoids

Sample: colon duodenum ileum jejunum pylorus

Gene expression data

<table>
<thead>
<tr>
<th>#</th>
<th>Gene Name</th>
<th>Ensemble ID</th>
<th>Mean (Case)</th>
<th>Mean (Control)</th>
<th>Log2(Fold Change)</th>
<th>p.value</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>A1BG</td>
<td>ENSG00000121410</td>
<td>0.0467</td>
<td>0.0074</td>
<td>2.8625</td>
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<td>0.7962</td>
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<td>3</td>
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<tr>
<td>4</td>
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<td>0.4870</td>
<td>0.5991</td>
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<td>5</td>
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<td>0.3033</td>
<td>0.1406</td>
<td>0.5495</td>
<td>0.2810</td>
</tr>
</tbody>
</table>

Figure S1 (H) The details page display of each dataset in genomics.

- 137 RNA-seq data sets
- 7.9 million transcriptional profiles
Users can enter question keywords to get answers.
GutUDB is a comprehensive intestinal disease multiomics database. Currently, the database has included 260,790 disease-gene associations, involving eight major omics including epigenomics, genomics, transcriptomics, spatial omics, single-cell omics, proteomics, metabolomics, and microbiomics data, spanning 56 distinct intestinal diseases across six various species. In addition, the database contains a variety of potential clinical treatments.

GutUDB integrates four core functions: browse, query, visualization and download, aiming to facilitate user access and use. Based on this database, researchers can conduct various omics data analyzes to explore genes related to certain intestinal diseases.

Database website:  [https://intestine.splicedb.net](https://intestine.splicedb.net)

“iMeta” 由威立、肠菌分会和华人科学家出版的开放获取期刊，主编由中科院微生物所刘双江和荷兰格罗宁根大学傅静远教授共同担任。目的是发表原创研究、方法和综述以促进宏基因组学、微生物组和生物信息学发展。目标是发表前10%(IF>20)的高影响力论文。期刊特色包括视频投稿、可重复分析、图片打磨、青年编委、中英双语、50万用户的社交媒体宣传等。2022年2月发行，相继被ESCI、Google Scholar、DOAJ、Scopus等数据库收录，发文161篇，被引2316次(Dimension, 2024/2/19)！

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