网络药理学寻找复方的靶点通路

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1 摘要

1.1 需求

复方组成：

The decoction consisted of 30 g astragalus membranaceus (huangqi 黄芪 3), 10 g polygonatum odoratum (yuzu 玉竹), 6 g scolopendra subspinipes mutilans (tianlong 蜈蚣 4), 6 g pberetima (dilong 地龙), 20 g solanum nigrum (longkui 龙葵 5), 20 g herbahedyotis (baihushecao 白花蛇舌草), 20 g semen coicis (yiyiren 薏苡仁), 6 g euphorbia helioscopia (zeqi 泽漆), 10 g curcuma longa (eshu 莪术 6) and 6 g tendril-leaved fritillary bulb (chuanbei 川贝母).

疾病：自身免疫性肠病

1.2 结果

- 网络药理图见 Fig. 4
- 通路聚焦见，Fig. 7 (SIRT1 相关)

2 前言

3 材料和方法

3.1 材料

3.2 方法

Mainly used method:

- R package `ClusterProfiler` used for gene enrichment analysis[1].
- Databses of `DisGeNet`, `GeneCards`, `PharmGKB` used for collating disease related targets[2–4].
- Website `HERB` http://herb.ac.cn/ used for data source[5].
- R version 4.3.2 (2023-10-31); Other R packages (eg., `dplyr` and `ggplot2`) used for statistic analysis or data visualization.

4 分析结果

5 结论

6 附：分析流程

6.1 网络药理学

6.1.1 成分靶点

Table 1 (下方表格) 为表格 Herbs information 概览。

(对应文件为 `Figure+Table/Herbs-information.xlsx`)

> 注：表格共有 10 行 18 列，以下预览的表格可能省略部分数据；表格含有 10 个唯一 'Herb_'。

Table 1: Herbs information

Herb_	Herb_p…	Herb_c…	Herb_e…	Herb_l…	Proper…	Meridians	UsePart	Function	Indica…
HERB00…	BAI HU…	白花蛇舌草	all - …	Herba …	Cold; …	Large …	whole …	1. To …	Lung h…
HERB00…	CHUAN …	川贝母	Bulb o…	Bulbus…	Minor …	Lung; …	bulb	To rem…	Lung h…
HERB00…	DI LONG	地龙	Earthworm	Pheretima	Cold; …	Bladde…	Pheret…	Treatm…	1. Rel…
HERB00…	E ZHU	莪术	Zedora…	Rhizom…	Warm; …	Spleen…	NA	To pro…	1. Its…
HERB00…	HUANG QI	黄芪	root o…	Radix …	Warm; …	Lung; …	root	To rei…	Commo…
HERB00…	LONG KUI	龙葵	Solanu…	NA	NA	NA	aerial…	NA	Clove …
HERB00…	WU GONG	蜈蚣	Centipede	Scolop…	Warm; …	Liver	dried …	To cal…	Acute …
HERB00…	YI YI REN	薏苡仁	seed o…	semen …	Minor …	Lung; …	seed	1. To …	Edema,…
HERB00…	YU ZHU	玉竹	Fragra…	Rhizom…	Mild; …	Lung; …	rhizome	To nou…	Lung s…
HERB00…	ZE QI	泽漆	Euphor…	NA	NA	NA	NA	NA	Edema …

Table 2 (下方表格) 为表格 Components of Herbs 概览。

(对应文件为 `Figure+Table/Components-of-Herbs.xlsx`)

> 注：表格共有 897 行 4 列，以下预览的表格可能省略部分数据；表格含有 831 个唯一 'Ingredient.name'。

Table 2: Components of Herbs

herb_id	Ingredient.id	Ingredient.name	Ingredient.alias
HERB000208	HBIN002551	1H-2,6-dioxacyclo…	14259-45-1; NSC 3…
HERB000208	HBIN003265	(1S,4aS,5R,7aS)-5…	(1S,4aS,5R,7aS)-5…

herb_id	Ingredient.id	Ingredient.name	Ingredient.alias
HERB000208	HBIN004057	2,3-dimethoxy-6-m...	NA
HERB000208	HBIN004058	2,3-dimethoxy-6-m...	NA
HERB000208	HBIN005745	2-hydroxy-3-methy...	2-hydroxy-3-methy...
HERB000208	HBIN005879	2-methoxy-3-methy...	2-methoxy-3-methy...
HERB000208	HBIN005968	2-methyl-3-hydrox...	NA
HERB000208	HBIN008641	3-hydroxy-2-methy...	NA
HERB000208	HBIN008695	3'-Hydroxyan...	3-(4-Methoxypheny...
HERB000208	HBIN009961	4,4-hydroxy- betw...	NA
HERB000208	HBIN010238	(4aS,6aR,6aS,6bR,...	NA
HERB000208	HBIN011872	5-o-p-methoxy cin...	AC1NSY1Y; 5-o-p-m...
HERB000208	HBIN012673	6-o-e-p-coumaroyl...	NA
HERB000208	HBIN012702	6-O- on- hydroxy ...	NA
HERB000208	HBIN012703	6-O- on- methoxy ...	NA
...	...	...	...

Figure 1 (下方图) 为图 intersection of all compounds 概览。

(对应文件为 `Figure+Table/intersection-of-all-compounds.pdf`)

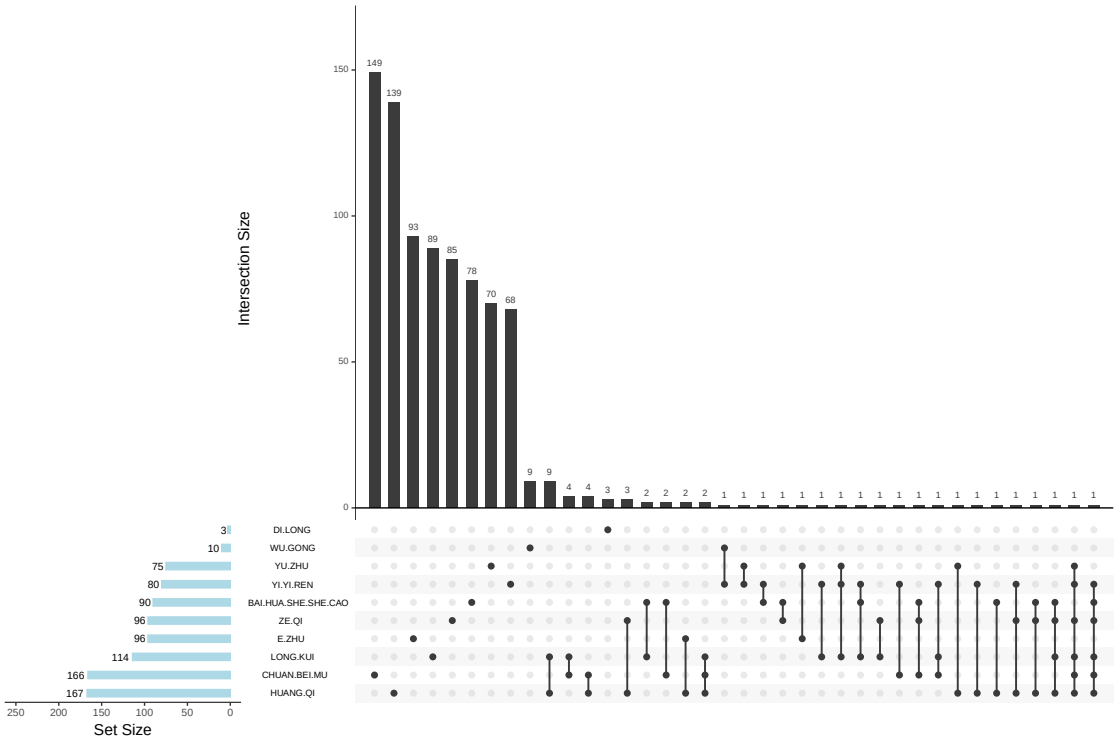

Figure 1: Intersection of all compounds

All_intersection :

(上述信息框内容已保存至 `Figure+Table/intersection-of-all-compounds-content`)

6.1.2 疾病

Figure 2 (下方图) 为图 Overall targets number of datasets 概览。

(对应文件为 `Figure+Table/Overall-targets-number-of-datasets.pdf`)

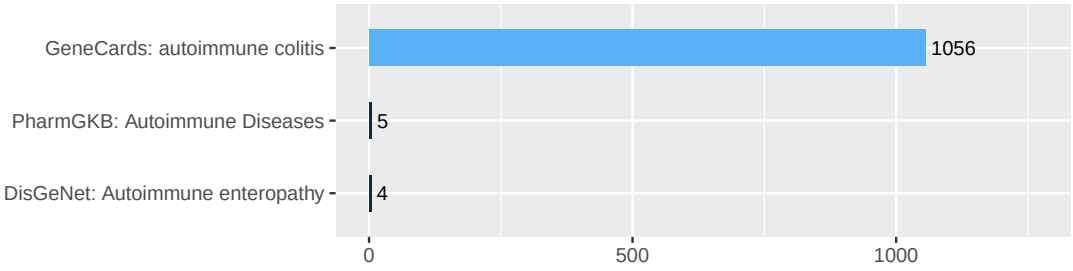

Figure 2: Overall targets number of datasets

The GeneCards data was obtained by querying :

autoimmune colitis

Restrict (with quotes) :

FALSE

Filtering by Score: :

Score $>$ 4

Table 3 (下方表格) 为表格 GeneCards used data 概览。

(对应文件为 `Figure+Table/GeneCards-used-data.xlsx`)

注：表格共有 1056 行 7 列，以下预览的表格可能省略部分数据；表格含有 1056 个唯一 'Symbol'。

Table 3: GeneCards used data

Symbol	Description	Category	UniProt_ID	GIFtS	GC_id	Score
AIRE	Autoimmune...	Protein Co...	O43918	52	GC21P044285	168.07
FAS	Fas Cell S...	Protein Co...	P25445	58	GC10P106652	99.65
CTLA4	Cytotoxic ...	Protein Co...	P16410	57	GC02P203854	83.05
CASP10	Caspase 10	Protein Co...	Q92851	56	GC02P201182	78.14
PRKCD	Protein Ki...	Protein Co...	Q05655	60	GC03P053156	77.18
FASLG	Fas Ligand	Protein Co...	P48023	57	GC01P172659	75.31
ITCH	Itchy E3 U...	Protein Co...	Q96J02	55	GC20P034363	67.8
COPA	COPI Coat ...	Protein Co...	P53621	50	GC01M160288	63.31
STAT1	Signal Tra...	Protein Co...	P42224	61	GC02M190908	56.55
PTPN22	Protein Ty...	Protein Co...	Q9Y2R2	55	GC01M113813	55.01
HLA-DRB1	Major Hist...	Protein Co...	P01911	55	GC06M090793	54.62
STAT3	Signal Tra...	Protein Co...	P40763	62	GC17M042313	54.2
TNF	Tumor Necr...	Protein Co...	P01375	61	GC06P125492	50.9
FOXP3	Forkhead B...	Protein Co...	Q9BZS1	56	GC0XM049250	50.67
IL6	Interleukin 6	Protein Co...	P05231	60	GC07P022725	49.63
...	...	...	...	...	...	...

6.1.3 成分-靶点-疾病

Figure 3 (下方图) 为图 Targets intersect with targets of diseases 概览。

(对应文件为 `Figure+Table/Targets-intersect-with-targets-of-diseases.pdf`)

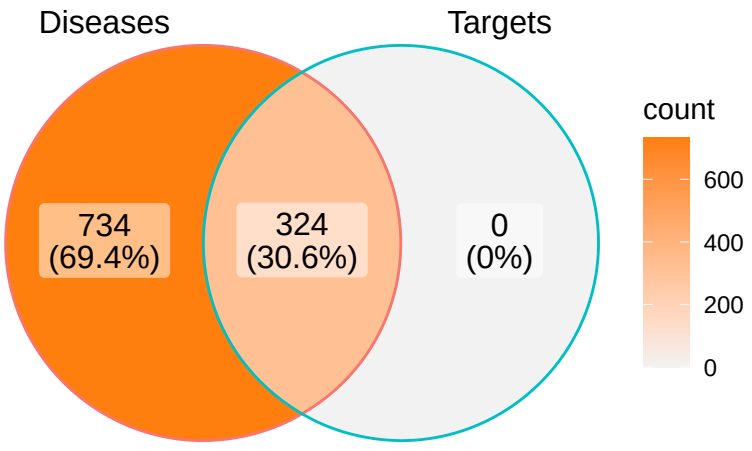

Figure 3: Targets intersect with targets of diseases

Intersection :

CYP3A5, IL2, TNF, IL2RA, FAS, PRKCD, FASLG, STAT1, STAT3, IL6, IL10, IFNG, TG, CASP8, KRAS, ACTA2, ZAP70, IL4, INS, IL1B, NFKB1, MPO, SYK, PDCD1, HLA-B, TGFB1, TLR4, CXCL8, PRTN3, STAT4, CD40LG, IL18, TPO, IL13, LTF, TNFRSF1A, HLA-A, IL12B, IL1A, CCL2, ICAM1, SPP1, ABCB1, ALB, TP53, CXCL10, TNFSF...

(上述信息框内容已保存至 `Figure+Table/Targets-intersect-with-targets-of-diseases-content`)

Figure 4 (下方图) 为图 Network pharmacology with disease 概览。

(对应文件为 `Figure+Table/Network-pharmacology-with-disease.pdf`)

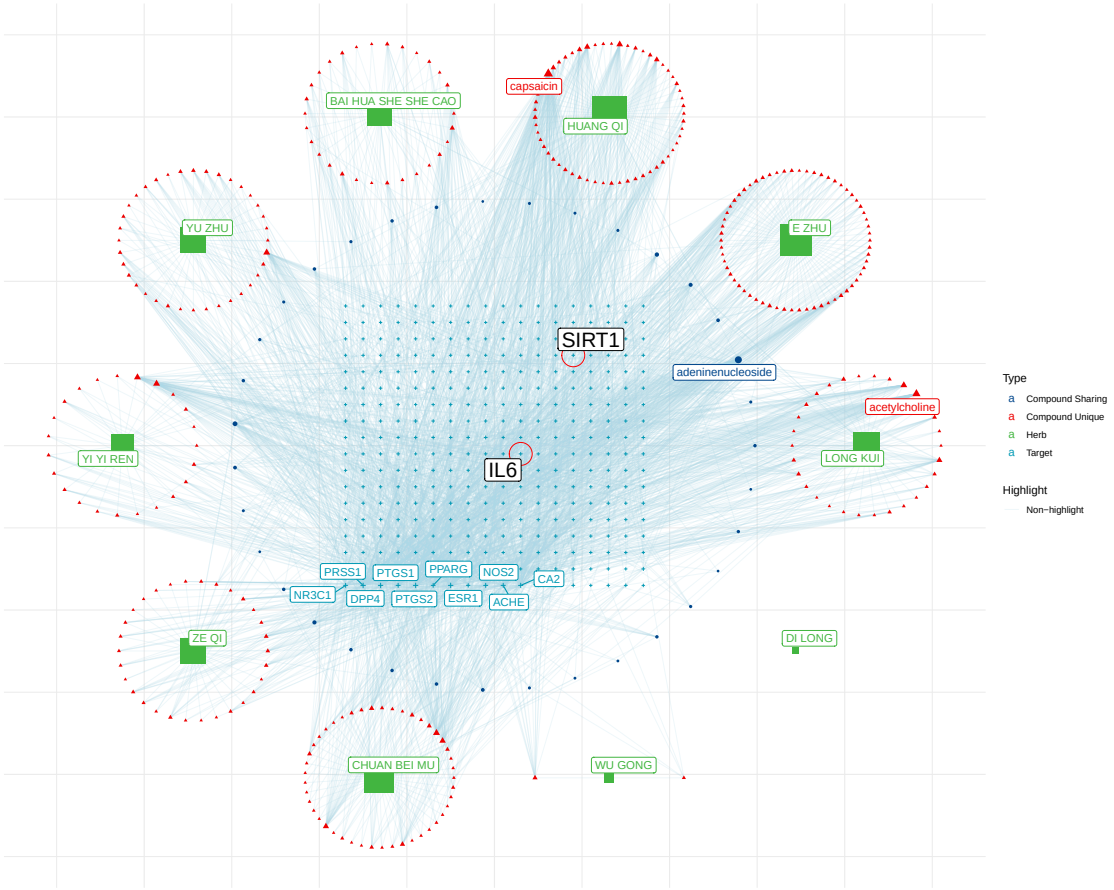

Figure 4: Network pharmacology with disease

6.1.4 富集分析

Figure 5 (下方图) 为图 KEGG enrichment 概览。

(对应文件为 `Figure+Table/KEGG-enrichment.pdf`)

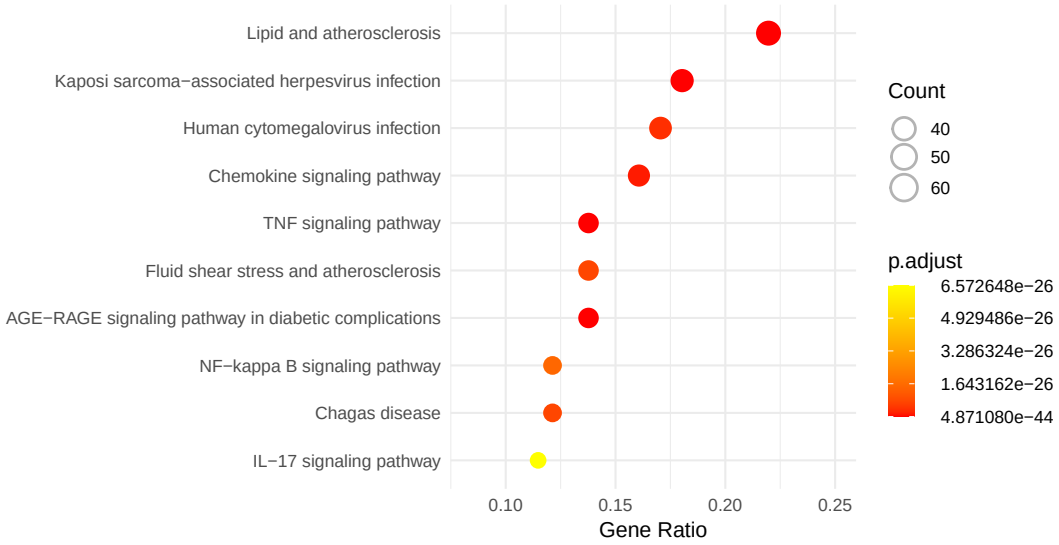

Figure 5: KEGG enrichment

Figure 6 (下方图) 为图 GO enrichment 概览。

(对应文件为 `Figure+Table/GO-enrichment.pdf`)

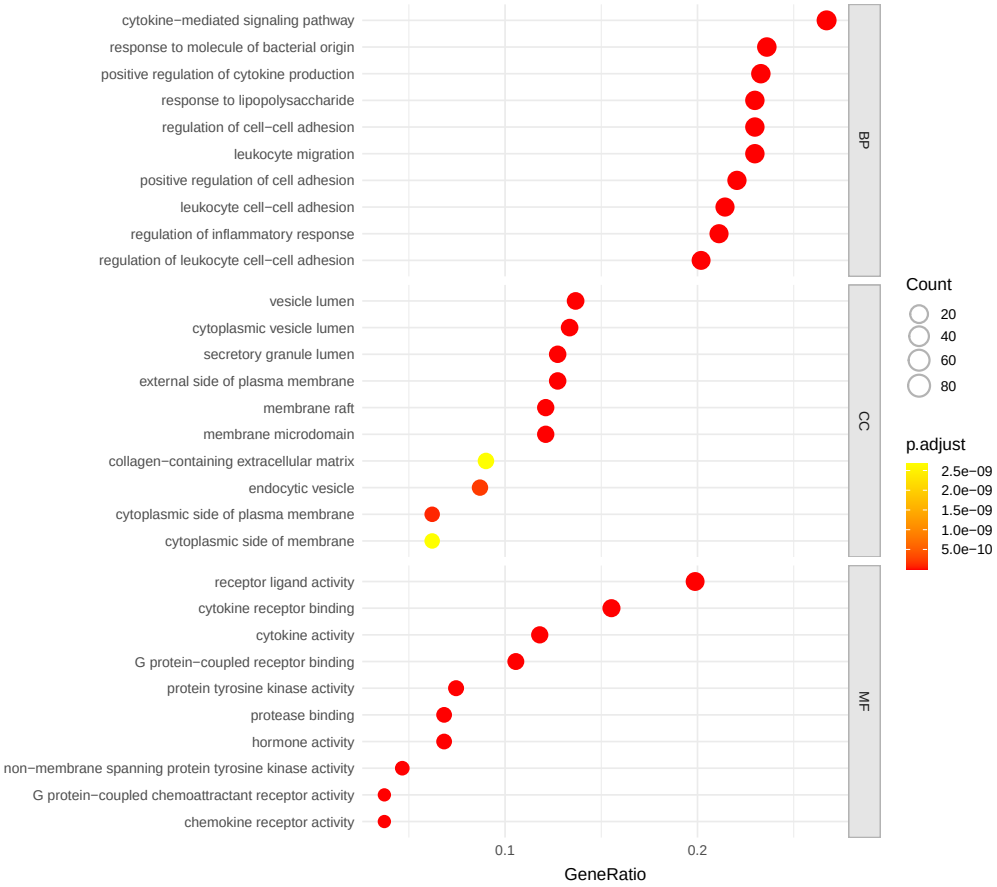

Figure 6: GO enrichment

6.1.5 富集结果筛选

以 SIRT1 筛选显著富集的通路

Table 4 (下方表格) 为表格 Filter by match genes 概览。

(对应文件为 `Figure+Table/Filter-by-match-genes.csv`)

> 注：表格共有 12 行 9 列，以下预览的表格可能省略部分数据；表格含有 12 个唯一 'ID'。

1. pvalue: 显著性 P。

Table 4: Filter by match genes

ID	Descri...	GeneRatio	BgRatio	pvalue	p.adjust	qvalue	geneID	Count
hsa04936	Alcoho...	36/305	142/8661	1.4302...	1.4302...	5.4304...	207/71...	36
hsa04068	FoxO s...	29/305	131/8661	7.6038...	4.3450...	1.6498...	207/47...	29
hsa04218	Cellul...	29/305	156/8661	9.6984...	4.0530...	1.5389...	207/47...	29
hsa04211	Longev...	20/305	89/8661	2.0347...	6.8640...	2.6062...	207/94...	20
hsa04213	Longev...	16/305	61/8661	1.8294...	5.6291...	2.1373...	207/94...	16
hsa04148	Effero...	22/305	156/8661	2.3337...	6.2089...	2.3575...	240/38...	22
hsa05206	MicroR...	32/305	310/8661	3.7074...	9.5796...	3.6373...	5243/4...	32
hsa04152	AMPK s...	18/305	121/8661	2.0060...	4.9708...	1.8874...	207/59...	18
hsa04310	Wnt si...	13/305	174/8661	0.0083...	0.0144...	0.0055...	595/14...	13
hsa05031	Amphet...	6/305	69/8661	0.0340...	0.0554...	0.0210...	1644/2...	6
hsa04922	Glucag...	6/305	107/8661	0.1753...	0.2504...	0.0950...	207/23...	6
hsa00760	Nicoti...	2/305	37/8661	0.3763...	0.4878...	0.1852...	4860/2...	2

Figure 7 (下方图) 为图 Hsa04068 visualization 概览。

(对应文件为 `Figure+Table/hsa04068.pathview.png`)

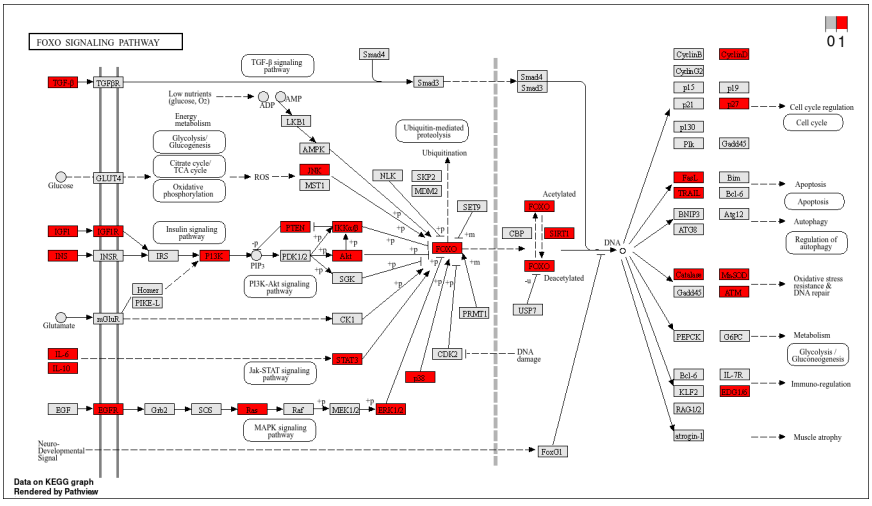

Figure 7: Hsa04068 visualization

Reference

1. Wu, T. *et al.* ClusterProfiler 4.0: A universal enrichment tool for interpreting omics data. *The Innovation* **2**, (2021).

2. Piñero, J. *et al.* The disgenet knowledge platform for disease genomics: 2019 update. *Nucleic Acids Research* (2019) doi:10.1093/nar/gkz1021.

3. Stelzer, G. *et al.* The genecards suite: From gene data mining to disease genome sequence analyses. *Current protocols in bioinformatics* **54**, 1.30.1–1.30.33 (2016).

4. Barbarino, J. M., Whirl-Carrillo, M., Altman, R. B. & Klein, T. E. PharmGKB: A worldwide resource for pharmacogenomic information. *Wiley interdisciplinary reviews. Systems biology and medicine* **10**, (2018).

5. Fang, S. *et al.* HERB: A high-throughput experiment- and reference-guided database of traditional chinese medicine. *Nucleic Acids Research* **49**, D1197–D1206 (2021).