实验6、Pearson相关分析

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编号 一 二 三 四 总分 评阅人

得分

软硬件平台:

1. 硬件平台: (硬件配置) i5, 2.9HZ处理器, 16G内存, 64位操作系统

2. 系统平台: (操作系统及其版本号) Windows10 企业版

3. 软件平台:(软件系统及其版本号,若是在线分析平台,还需要提供URL地

址) R3.4.1 , Rstudio

一、目的要求:

- 1、加深对相关性的理解;
- 2、熟悉并掌握相关性分析所涉及的R语言函数和脚本;
- 3、从统计学角度来理解不同基因转录表达之间的生物学关联。

二、实验内容:

1、不同基因表达水平之间相关性的分析

该环节需要大家提前准备好一个基因表达谱数据,如果没有,则有授课 教师提供(gds4794)。

1.1、加载数据

加载GEOquery包,读取基因表达谱数据(gds4794)。

setwd("D:/RFile/实验六")

library(GEOquery)

gds4794 <- getGEO(filename='GDS4794.soft.gz')

1.2、提取数据表

从该基因表达谱数据中提取基因表达数据表。

```
data<-Table(gds4794)
rownames(data)<-data[,1]
row.name = rownames(data)</pre>
```

1.3、随机抽样

从该数据表中随机抽取一行数据,记录对应的探针ID和基因名称。

n = 1

set.seed(1)

sam.row.name = sample(row.name,n,replace=F)

sam.row.name

a <- unlist(data[sam.row.name,3:67])

gene_name_a <- as.character(data[sam.row.name,2])</pre>

gene_name_a

1.5、不同基因表达水平Pearson相关系数计算

遍历整个基因表达谱数据表,利用R语言中的Pearson相关系数检验函数,分析其他所有基因表达水平,与1.3步随机抽取的基因表达水平之间的相关性;记录p.value和相关系数值(cor);同时为所有p.value和相关系数值(cor)关联基因名称。

p = NULL

r = NULL

for(i in 1:nrow(data)){

```
b <- unlist(data[i,3:67])

x <- cor.test(a,b, method="pearson")

p <- c(p,x$p.value)

r <- c(r,x$estimate)

}

names(p)<-data[,2]

names(r)<-data[,2]</pre>
```

1.6、高相关性基因筛选

设定p.value (至少小于0.05) 和相关系数r的筛选阈值(至少大于 0.5) ;对1.5步计算结果进行筛选,保留符合条件的基因;对符合条件的 p.value和相关系数r所关联的基因名称进行交集运算;查看交集运算结果中 是否存在非法基因信息,如果有去除它。

```
p_value = 0.01

r_cutoff = 0.6

p2 <- p[p<p_value]

r2 <- r[r>r_cutoff]

length(p2)

length(r2)

genes <- intersect(names(p2),names(r2))

genes[-match("ARHGAP26",genes)]

length(genes)</pre>
```

```
tail(genes)
genes2 <-c(gene_name_a,genes[1:645])
out = "pearson-related-genes.txt"
write.table(genes2,out)</pre>
```

1.7、高相关性基因生物学意义的探讨

为什么有些基因的表达与你所选择的基因表达水平之间存在较高的相关性?

三、实验结果:

- > sam. row. name
- [1] "205069_s_at"
- > gene_name_a
- [1] "ARHGAP26"
- > length(genes2)
- [1] 646

结果中第一行为抽的样本基因共有645个基因与之相关。

四、讨论:

1.7 在生物体中一个性状往往是由多个基因共同调控的,甚至会影响到其他性状或代谢过程,还有一些反馈调节也可能会影响到基因的表达。还有一种可能,这些基因可能调控着同一条代谢通路。

在DAVID网站处理结果

Category	Term	Со	%	PV	Genes
		unt		alu	
				е	
GOTERM_C	GO:0030054~cel	55	9.35	3.4	KCNC3, SRCIN1, SYT2, CLSTN1,
C_DIRECT	I junction		3741	6E-	GABBR1, GRIK5, SYT9, SYNGR1,
				19	SYP, ATP2B2, PRRT2, GRIN2C,
					HOMER3, DLG4, CDK16, SCAMP5,

	<u> </u>		1		Taura
					SVOP, BCR, PTPRR, BSN, MINK1,
					CBLN3, CBLN1, VAMP2, UNC13C,
					FAIM2, UNC13A, PRKCZ, ACHE,
					BRSK1, RIMS1, RIMS4, SYN1, ATN1,
					ARHGAP44, LRFN1, GABRD,
					PARD6A, DLGAP3, GABRA6, SYT12,
					NLGN2, SLC6A17, GRIA4, IGSF9B,
					KCNK1, SHANK3, SLC17A7, NMT1,
					MAP1S, GTF2F1, CYFIP2, SPTBN2,
					TPRG1L, ADGRL1
GOTERM_B	GO:0007269~ne	15	2.55	1.0	PPFIA3, RAB3A, PPFIA4, CPLX1,
		13			
P_DIRECT	urotransmitter		102	7E-	NRXN2, NRXN3, SYT2, STXBP1,
	secretion			10	BRSK1, RIMS1, GRM4, SYN1,
					DNAJC5, VAMP2, UNC13A
GOTERM_C	GO:0048786~pr	12	2.04	1.8	SYP, SLC17A7, PPFIA3, PPFIA4,
C_DIRECT	esynaptic active		0816	0E-	SYN1, BSN, SV2A, UNC13C,
	zone			10	ADORA1, RIMS1, RIMS4, UNC13A
GOTERM_B	GO:0007268~ch	29	4.93	3.2	KCNC4, SCN1B, CPLX1, SNCB,
P_DIRECT	emical synaptic		1973	5E-	SYN1, GRIN2C, SLC1A6, LRFN1,
	transmission			10	DLG4, APBA2, KCNQ2, NPFF,
					GABRD, GPR176, SCN2B, NRXN2,
					SLC12A5, ASIC2, MINK1, BSN,
					PRKCG, GRIA4, GRM1, GRM4,
					CBLN1, CACNA1G, RIT2, UNC13C,
					UNC13A
GOTERM_C	GO:0014069~po	25	4.25	4.5	ALS2, BCR, DLGAP3, SRCIN1,
C_DIRECT	stsynaptic	25	1701	3E-	CLSTN3, BAIAP2, CLSTN1, GRIK5,
C_DIRECT	1 .		1701		
	density			10	BSN, MINK1, PRKCG, IGSF9B,
					GRM1, ADORA1, SHANK3,
					PPP1R9B, SYN1, GRIN2C, PTK2B,
					ARRB1, HOMER3, MAPT, LRFN1,
					DLG4, ADD2
GOTERM_C	GO:0045211~po	26	4.42	1.5	SRCIN1, CLSTN3, CLSTN1, GRIK5,
C_DIRECT	stsynaptic		1769	2E-	GABBR1, ADORA1, ANK1, HOMER3,
	membrane			09	GRIN2C, LRFN1, DLG4, IQSEC3,
					GABRD, BCR, DLGAP3, COL13A1,
					GABRA6, NLGN2, MINK1, GRIA4,
					IGSF9B, SHANK3, CBLN1, ARRB1,
					APBB1, FAIM2
GOTERM_B	GO:0016079~sy	10	1.70	4.4	RAB3A, CPLX2, CPLX1, PIP5K1C,
P_DIRECT	naptic vesicle		068	6E-	DNAJC5, ADGRL1, VAMP2,
5201	exocytosis			09	UNC13C, RIMS1, UNC13A
GOTERM_C	GO:0043195~ter	14	2.38	1.4	SYP, RAB3A, CPLX2, CPLX1, SYN1,
_		14			
C_DIRECT	minal bouton		0952	8E-	PVALB, GRIK5, STXBP1, DNAJC5,

				08	SV2A, UNC13C, SYNGR1, ADORA1,
				00	UNC13A
GOTERM_C	GO:0008021~sy	16	2.72	4.2	SYP, RAB3A, SVOP, SYN1, SYT2,
C_DIRECT	naptic vesicle	10	1088	3E-	DLG4, APBA2, DNAJC5, TPRG1L,
C_DIRECT	Haptic vesicle		1000	08	SLC6A17, SV2A, BRSK1, VAMP2,
				00	CDK16, STX1B, DNM1
GOTERM_B	GO:0048172~re	8	1.36	4.5	SYP, SHISA6, RAB3A, PPFIA3,
P_DIRECT	gulation of	0	0544	0E-	SHISA8, SLC8A2, SYNGR1, UNC13A
P_DIRECT	short-term		0344	08	SHISAO, SECOAZ, STINGKI, UNCISA
	neuronal			00	
	synaptic				
	plasticity				
GOTERM_C	GO:0043025~ne	29	4.93	9.4	ALS2, CPLX2, CPLX1, SRCIN1,
C_DIRECT	uronal cell body	23	1973	2E-	FKBP4, ADORA1, ATP2B2, SEZ6L2.
C_DIRECT	aronar cen body		1370	08	PVALB, PTK2B, TIAM1, PDE1A,
					KNDC1, TUBB4A, DAB2IP, KCND1,
					BAIAP2, SPTBN4, SLC12A5, RTN4R,
					ASIC2, GDPD5, IGSF9B, PPP1R9B,
					MAP1S, SPTBN2, FBXO31, APBB1,
					SEZ6
GOTERM_C	GO:0030425~de	30	5.10	9.9	ALS2, KCNC1, CPLX2, KCNC3,
C_DIRECT	ndrite		2041	3E-	CPLX1, SRCIN1, GABBR1, GNG13,
				08	GRIK5, TRIM3, SYN1, PTK2B, MAPT,
					LMTK3, KNDC1, NPFF, KCND3,
					DAB2IP, KCND1, MINK1, BSN,
					PRKCG, GRIA4, IGSF9B, KCNK1,
					GRM1, AMIGO1, PPP1R9B, MAP1S,
					MAPK8IP3
GOTERM_C	GO:0042734~pr	13	2.21	1.3	KCNC3, NRXN2, GRIK5, GABBR1,
C_DIRECT	esynaptic		0884	6E-	NLGN2, ADORA1, RIMS1, SYP,
	membrane			07	GRM4, ADGRL1, UNC13C, APBB1,
					UNC13A
GOTERM_C	GO:0045202~sy	21	3.57	2.1	GABRD, NMNAT2, PPFIA4, ACHE,
C_DIRECT	napse		1429	3E-	SRCIN1, SNCB, GABRA6, NLGN2,
				07	ASIC1, KCNK1, SHISA6, CBLN3,
					ATP2B2, SHISA8, PRRT2, MAP1S,
					CYFIP2, DLG4, VAMP2, ADGRL1,
					APBB1
GOTERM_B	GO:0014047~glu	9	1.53	8.2	SLC17A7, RAB3A, PPFIA3, PPFIA4,
P_DIRECT	tamate secretion		0612	8E-	CPLX1, SLC1A6, STXBP1, VAMP2,
				07	RIMS1
GOTERM_C	GO:0005886~pla	16	27.8	1.0	SLC22A17, KCNC1, CADM3, KCNC4,
C_DIRECT	sma membrane	4	9116	8E-	ADCY1, KCNC3, ATP1B2, SYT2,
				06	SYT3, TSPAN5, GRIK5, SYT9,

L1CAM, FLCN, ADDRA1, RELL2, CDH22, ATP282, SEZ6L2, DIRAS1, ANK1, PRRT2, GRINZC, HOMER3, TIAM1, VPS4A, DNAIC5, SLC4A5, SCAMP5, DAB2IP, CRTAM, KCND3, KCND1, MADD, MDGA1, BAIAP2, TTC7B, PTPRR, SOCS7, TMEM25, CRHR1, ARRB1, CLIP3, VAMP2, UNC13C, ADD2, NCR3LG1, GLG1, ARFGAP2, ACHE, SCN1B, ARHGEF25, PANX2, RUNDC3A, NKAIN4, RIMS1, KCN3, AMER3, PLCH2, TTYH1, LRFN1, ENTPD6, CDC42EP4, GABRD, PARD6A, MLC1, TBC1D10B, GABRA6, SYT12, SPTBN4, KCNK1, RNF103-CHMP3, ANKH, SHANK3, NMT2, NMT1, KCN39, CACNA1G, TNK2, CACNA1F, RT12, GPR83, GPR162, CLTB, BCAR1, GABBR1, PPIPSK1, MTSS11, MCF2L, PCDHGA1, ST6GALNAC6, AP2B1, NISCH, MGRN1, DYNLL2, SLC1A6, MAPT, DLG4, CALN1, SV2A, KCNQ2, CDK16, DPP6, TRPM3, ADAM11, GPR176, ZP2, NRXN2, MICAL3, STXBP1, PRKCG, CACNC2, GRM1, STXB, GPR37C, GACNC2, GRM1, GPR37C, GACNC2, GRM2, GRM2, GRM3, GR		I		1	T	Ţ
ANK1, PRRT2, GRIN2C, HOMER3, TIAM1, VPS4A, DNAIC5, SLC4A5, SCAMP5, DAB2IP, CRTAM, KCND3, KCND1, MADD, MDGA1, BAIAP2, TTC7B, PTPRR, SOCS7, TMEM25, CRHR1, ARRB1, CLIP3, VAMP2, UNC13C, ADD2, NCR3LG1, GLG1, ARFGAP2, ACHE, SCN1B, ARHGEF25, PANX2, RUNDC3A, NKAIN4, RIMS1, KCN13, AMER3, PLCH2, TTYH1, LRFN1, ENTPD6, CDC42EP4, GABRD, PARD6A, MLC1, TBC1D10B, GABRA6, SYT12, SPTBN4, KCNK1, RNF103-CHMP3, ANKH, SHANK3, NMT2, NMT1, KCN19, CACNA1G, TNK2, CACNA1F, RIT2, GPR83, GPR162, CLTB, BCAR1, GABBR1, PPIP5K1, MTSS1L, MCF2L, PCDHGA1, ST6GALNAC6, AP2B1, NISCH, MGRN1, DYNLL2, SLC1A6, MAPT, DLG4, CALN1, SV2A, KCNQ2, CDK16, DPP6, TRPM3, ADAM11, GPR176, ZP2, NRXN2, MICAL3, STXBP1, PRKCG, CACNG2, GRM1, STX1B, GPR37L1, GRM4, MAST1, CD99L2, GNB5, SE26, MAP3K12, EPN1, PLPP4, RAB3A, PRKCZ, PTOV1, ABTB1, GNG13, RHBG, DISP2, STUB1, TPCN1, RGS11, TSPYL2, FAT2, ENO2, APBA2, CAMK2B, EHD1, INPP5A, DGKQ, SLC8A2, NF2, COL13A1, SLC12A5, ASIC2, RTN4R, TMEM266, GRIA4, ASIC1, SLC17A7, PPP1R9B, GBA2, AP2A2, CDH15, TENM1, JMID6, SLC6A8, CDH18, ATP6VOA1, DGKZ, ADGR1, APBB1, DNM1 GOTERM_C GO:0030672-sy 11 187 2.7 SLC17A7, SVOP, SYN1, SY12, APA22, CDIRECT naptic vesicle membrane 06 SLC6A17, SYNGR1, SCAMP5						L1CAM, FLCN, ADORA1, RELL2,
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TTC7B, PTPRR, SOCS7, TMEM25, CRHR1, ARRB1, CLIP3, VAMP2, UNC13C, ADD2, NCR3LG1, GLG1, ARFGAP2, ACHE, SCN1B, ARHGEF25, PANX2, RUNDC3A, NKAIN4, RIMS1, KCN13, AMER3, PLCH2, TTYH1, LRFN1, ENTPD6, CDC42EP4, GABRD, PARD6A, MLC1, TBC1D10B, GABRA6, SY712, SPTBN4, KCNK1, RNF103-CHMP3, ANKH, SHANK3, NMT2, NMT1, KCN19, CACNA1G, TNK2, CACNA1F, RIT2, GPR83, GPR162, CLTB, BCAR1, GABBR1, PPIP5K1, MTSS1L, MCF2L, PCDHGA1, ST6GALNAC6, AP2B1, NISCH, MGRN1, DYNLL2, SLC1A6, MAPT, DLG4, CALN1, SV2A, KCNQ2, CDK16, DPP6, TRPM3, ADAM11, GPR176, ZP2, NRXN2, MICAL3, STXBP1, PRKCG, CACNG2, GRM1, STX1B, GPR37L1, GRM4, MAST1, CD99L2, GNB5, SEZ6, MAP3K12, EPN1, PLPP4, RAB3A, PRKCZ, PTOV1, ABTB1, GNG13, RHBG, DISP2, STUB1, TPCN1, RGS11, TSPYL2, FAT2, ENO2, APBA2, CAMK2B, EHD1, INPP5A, DGKQ, SLC8A2, NF2, COL13A1, SLC12A5, ASIC2, RTN4R, TMEM266, GRIA4, ASIC1, SLC17A7, PPP1R9B, GBA2, AP2A2, CDH18, ATP6V0A1, DGKZ, AP2A2, CDH18, ATP6V0A1, DGKZ, AP2A2, CDH18, APBB1, DNM1 GOTERM_C C_DIRECT naptic vesicle membrane TTC7B, APBB1, SCC, TMMP2, SYT12, SYT9, SV2A, VAMP2, SLC6A17, SYNGR1, SCAMP5						SCAMP5, DAB2IP, CRTAM, KCND3,
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ST6GALNAC6, AP2B1, NISCH, MGRN1, DYNLL2, SLC1A6, MAPT, DLG4, CALN1, SV2A, KCNQ2, CDK16, DPP6, TRPM3, ADAM11, GPR176, ZP2, NRXN2, MICAL3, STXBP1, PRKCG, CACNG2, GRM1, STX1B, GPR37L1, GRM4, MAST1, CD99L2, GNB5, SEZ6, MAP3K12, EPN1, PLPP4, RAB3A, PRKCZ, PTOV1, ABTB1, GNG13, RHBG, DISP2, STUB1, TPCN1, RGS11, TSPYL2, FAT2, ENO2, APBA2, CAMK2B, EHD1, INPP5A, DGKQ, SLC8A2, NF2, COL13A1, SLC12A5, ASIC2, RTN4R, TMEM266, GRIA4, ASIC1, SLC17A7, PPP1R9B, GBA2, AP2A2, CDH15, TENM1, JMJD6, SLC6A8, CDH18, ATP6V0A1, DGKZ, ADGRL1, APBB1, DNM1 GOTERM_C C_DIRECT naptic vesicle membrane ST6GALNAC6, AP2B1, NISCH, MGRN1, DYNLL2, SLC1A6, MAPT, DLG4, CALN1, SY2A, NEXPA, ADAM11, GPR176, ZP2, NRXN2, MICAL3, STXBP1, PRKCG, CACNG2, GRM1, STXBP1, DLG4, GPT, SUCMA, STXBP1, STXBP1, PRKCG, CALN1, SV2A, KCNQ2, CDK16, CACNG2, GRM1, STXBP1, CACNG2, CDK16, MAPT, DLG4, CACNG2, CDK16, MAPT, DLG4, CACNG2, CACNG2, CDK16, MAPT, DLG4, CACNG2, CDK16, MAPT, DLG4, CACNG2, CAM5, MAPC, SLC1A7, SVC1A, SVC1A						CLTB, BCAR1, GABBR1, PPIP5K1,
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DLG4, CALN1, SV2A, KCNQ2, CDK16, DPP6, TRPM3, ADAM11, GPR176, ZP2, NRXN2, MICAL3, STXBP1, PRKCG, CACNG2, GRM1, STX1B, GPR37L1, GRM4, MAST1, CD99L2, GNB5, SEZ6, MAP3K12, EPN1, PLPP4, RAB3A, PRKCZ, PTOV1, ABTB1, GNG13, RHBG, DISP2, STUB1, TPCN1, RGS11, TSPYL2, FAT2, ENO2, APBA2, CAMK2B, EHD1, INPP5A, DGKQ, SLC8A2, NF2, COL13A1, SLC12A5, ASIC2, RTN4R, TMEM266, GRIA4, ASIC1, SLC17A7, PPP1R9B, GBA2, AP2A2, CDH15, TENM1, JMJD6, SLC6A8, CDH18, ATP6V0A1, DGKZ, ADGRL1, APBB1, DNM1 GOTERM_C C_DIRECT naptic vesicle membrane DLG4, CALN1, SV2A, KCNQ2, CDK16, DPP6, TRPM3, ADAM11, GPR176, ZP2, NRXN2, MICAL3, STXBP1, PRKCG, CACNG2, GRM1, STX1B, GPR37L1, GRM4, MAST1, CD99L2, GNB5, SEZ6, MAP3K12, EPN1, PLPP4, RAB3A, PRKCZ, PTOV1, ABTB1, GNG13, RHBG, DISP2, STUB1, TPCN1, RGS11, TSPYL2, FAT2, ENO2, APBA2, CAMK2B, EHD1, INPP5A, DGKQ, SLC6A8, CDH18, ATP6V0A1, DGKZ, ADGRL1, APBB1, DNM1 GOTERM_C C_DIRECT National State of Color						ST6GALNAC6, AP2B1, NISCH,
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STX1B, GPR37L1, GRM4, MAST1, CD99L2, GNB5, SEZ6, MAP3K12, EPN1, PLPP4, RAB3A, PRKCZ, PTOV1, ABTB1, GNG13, RHBG, DISP2, STUB1, TPCN1, RGS11, TSPYL2, FAT2, ENO2, APBA2, CAMK2B, EHD1, INPP5A, DGKQ, SLC8A2, NF2, COL13A1, SLC12A5, ASIC2, RTN4R, TMEM266, GRIA4, ASIC1, SLC17A7, PPP1R9B, GBA2, AP2A2, CDH15, TENM1, JMJD6, SLC6A8, CDH18, ATP6V0A1, DGKZ, ADGRL1, APBB1, DNM1 GOTERM_C GO:0030672~sy naptic vesicle membrane 11.87 2.7 SLC17A7, SVOP, SYN1, SYT2, SYT12, SYT9, SV2A, VAMP2, SLC6A17, SYNGR1, SCAMP5						GPR176, ZP2, NRXN2, MICAL3,
CD99L2, GNB5, SEZ6, MAP3K12, EPN1, PLPP4, RAB3A, PRKCZ, PTOV1, ABTB1, GNG13, RHBG, DISP2, STUB1, TPCN1, RGS11, TSPYL2, FAT2, ENO2, APBA2, CAMK2B, EHD1, INPP5A, DGKQ, SLC8A2, NF2, COL13A1, SLC12A5, ASIC2, RTN4R, TMEM266, GRIA4, ASIC1, SLC17A7, PPP1R9B, GBA2, AP2A2, CDH15, TENM1, JMJD6, SLC6A8, CDH18, ATP6V0A1, DGKZ, ADGRL1, APBB1, DNM1 GOTERM_C GO:0030672~sy 11 1.87 2.7 SLC17A7, SVOP, SYN1, SYT2, C_DIRECT naptic vesicle membrane 06 SLC6A17, SYNGR1, SCAMP5						STXBP1, PRKCG, CACNG2, GRM1,
EPN1, PLPP4, RAB3A, PRKCZ, PTOV1, ABTB1, GNG13, RHBG, DISP2, STUB1, TPCN1, RGS11, TSPYL2, FAT2, ENO2, APBA2, CAMK2B, EHD1, INPP5A, DGKQ, SLC8A2, NF2, COL13A1, SLC12A5, ASIC2, RTN4R, TMEM266, GRIA4, ASIC1, SLC17A7, PPP1R9B, GBA2, AP2A2, CDH15, TENM1, JMJD6, SLC6A8, CDH18, ATP6V0A1, DGKZ, ADGRL1, APBB1, DNM1 GOTERM_C GO:0030672~sy naptic vesicle membrane 11 1.87 2.7 SLC17A7, SVOP, SYN1, SYT2, SYT12, SYT19, SV2A, VAMP2, SLC6A17, SYNGR1, SCAMP5						STX1B, GPR37L1, GRM4, MAST1,
EPN1, PLPP4, RAB3A, PRKCZ, PTOV1, ABTB1, GNG13, RHBG, DISP2, STUB1, TPCN1, RGS11, TSPYL2, FAT2, ENO2, APBA2, CAMK2B, EHD1, INPP5A, DGKQ, SLC8A2, NF2, COL13A1, SLC12A5, ASIC2, RTN4R, TMEM266, GRIA4, ASIC1, SLC17A7, PPP1R9B, GBA2, AP2A2, CDH15, TENM1, JMJD6, SLC6A8, CDH18, ATP6V0A1, DGKZ, ADGRL1, APBB1, DNM1 GOTERM_C GO:0030672~sy naptic vesicle membrane 11 1.87 2.7 SLC17A7, SVOP, SYN1, SYT2, SYT12, SYT19, SV2A, VAMP2, SLC6A17, SYNGR1, SCAMP5						CD99L2, GNB5, SEZ6, MAP3K12,
PTOV1, ABTB1, GNG13, RHBG, DISP2, STUB1, TPCN1, RGS11, TSPYL2, FAT2, ENO2, APBA2, CAMK2B, EHD1, INPP5A, DGKQ, SLC8A2, NF2, COL13A1, SLC12A5, ASIC2, RTN4R, TMEM266, GRIA4, ASIC1, SLC17A7, PPP1R9B, GBA2, AP2A2, CDH15, TENM1, JMJD6, SLC6A8, CDH18, ATP6V0A1, DGKZ, ADGRL1, APBB1, DNM1 GOTERM_C C_DIRECT naptic vesicle membrane 1 1.87 2.7 SLC17A7, SVOP, SYN1, SYT2, SYT12, SYT9, SV2A, VAMP2, SLC6A17, SYNGR1, SCAMP5						
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membrane 06 SLC6A17, SYNGR1, SCAMP5		<u> </u>	11			
	C_DIRECT	· '		0748		
GOTERM_B GO:0006887~ex 13 2.21 4.2 ANK1, CPLX1, SRCIN1, ARHGAP44,		membrane			06	SLC6A17, SYNGR1, SCAMP5
	GOTERM_B	GO:0006887~ex	13	2.21	4.2	ANK1, CPLX1, SRCIN1, ARHGAP44,

P_DIRECT	ocytosis		0884	5E-	MICAL3, BRSK2, SCRN1, DNAJC5,
				06	VAMP2, CDK16, UNC13C, RIMS1,
					SCAMP5
GOTERM_B	GO:0060079~ex	8	1.36	1.0	SLC17A7, GRIN2C, MECP2, GRIK5,
P_DIRECT	citatory		0544	9E-	NPAS4, ADORA1, SEZ6, NPFF
	postsynaptic			05	
	potential				

其中详细说明了基因之间的关系与联系。