PathwayLinker report

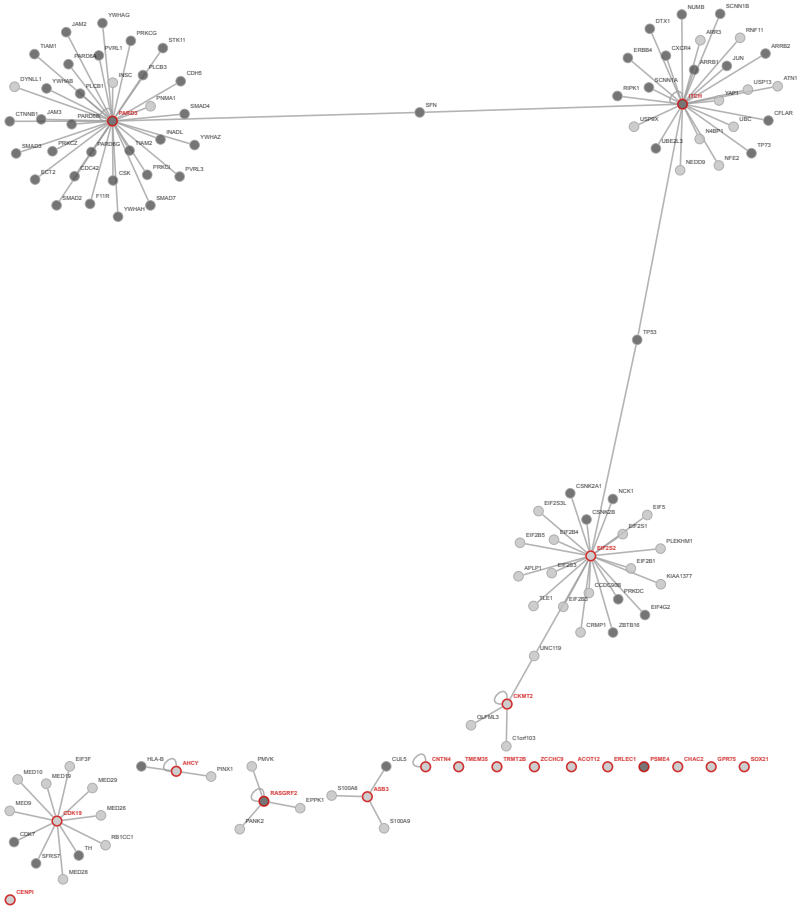
This is the PDF formatted report of your PathwayLinker job (downloaded: November 24, 2017). Protein identifiers are UniProt primary accessions or protein names. Pathway and database names and UniProt accessions are hyperlinked.

Addresses

Interactive report page	http://pathwaylinker.org/job.cgi?j=1511525998.96608266998
PDF report	http://pathwaylinker.org/pdf.cgi?j=1511525998.96608266998
In machine-readable (txt) format	http://pathwaylinker.org/txt.cgi?j=1511525998.96608266998
Feedback and questions	http://pathwaylinker.org/feedback

Parameters

Organism	*Homo sapiens*
Search terms and queried proteins	ACOT12 (), AHCY (Q8IWV2), ASB3 (P20042), ASIP (Q8TEW0), CDK19 (Q96J02), CENPI (Q14997), CHAC2 (Q53FP2), CKMT2 (Q96DZ1), CNTN4 (Q9Y575), EIF2S2 (O14827), ERLEC1 (Q8WYK0), GPR75 (P23526), ITCH (Q92674), PSME4 (O95800), RASGRF2 (Q9Y651), SLC22A16 (Q8N567), SOX21 (), TMEM35 (Q9BWU1), TRMT2B (P17540), ZCCHC9 (Q8WUX2)
Are unreviewed (UniProtKB/TrEMBL) proteins allowed as interactors?	no
Sources of interactions	BioGrid, HPRD, STRING "exp"
Sources of signaling pathways	KEGG, Reactome, SignaLink



The network of the queried protein(s) and its (their) interactors. Red nodes: queried proteins. Dark gray: signaling pathway member proteins. Light gray: non-pathway members. Links: interactions. The signaling pathway memberships of each protein and the interactions are listed below.

P-values: Which signaling pathways are significantly overrepresented in the set of displayed proteins containing the queried protein(s) and its (their) first neighbor interactor(s)? See detailed explanation below the table. p-values below 0.01 are marked.

Signaling pathway	Displayed proteins	All proteins of pathway	P-value
Tight junction (KEGG)	15	180	**7.3e-24**
Endocytosis (KEGG)	16	284	**1.3e-22**
Cell cycle (KEGG)	11	173	**1.8e-16**
Adherens junction (KEGG)	10	115	**1.8e-16**
WNT (KEGG)	11	229	**4e-15**
Chemokine (KEGG)	11	243	**7.8e-15**
NT (KEGG)	9	187	**1.3e-12**
Leukocyte (KEGG)	8	156	**1.5e-11**
Immune (Reactome)	9	384	**8e-10**
TGF beta (Reactome)	4	15	**2.2e-09**
Helicobacter infection (KEGG)	6	103	**2.6e-09**
Colorectal cancer (KEGG)	6	104	**2.8e-09**
CAM (KEGG)	7	190	**2.9e-09**
Cancer (KEGG)	9	502	**8.2e-09**
NGF (Reactome)	6	211	**1.9e-07**
Pancreatic cancer (KEGG)	5	111	**2.1e-07**
Rho GTPases (Reactome)	5	125	**3.9e-07**
MAPK (KEGG)	7	393	**4.2e-07**
E.coli infection (KEGG)	4	72	**1.6e-06**
GPCR (Reactome)	8	814	**5.1e-06**
TGF-beta (SignaLink)	5	223	**6.6e-06**
TGF (KEGG)	4	112	**9.4e-06**
EGFR (Reactome)	3	44	**1.9e-05**
GnRH (KEGG)	4	136	**2e-05**
ErbB (KEGG)	4	145	**2.6e-05**
WNT (SignaLink)	4	149	**2.9e-05**
Melanogenesis (KEGG)	4	151	**3e-05**
EGF/MAPK (SignaLink)	5	388	**9.3e-05**
P53 (KEGG)	3	93	**0.00018**
Depression (KEGG)	3	102	**0.00023**
Calcium (KEGG)	4	273	**0.0003**
BMP (Reactome)	2	22	**0.0003**
PtdIns (KEGG)	3	111	**0.0003**
CML (KEGG)	3	112	**0.00031**
LTP (KEGG)	3	113	**0.00032**
Gap junction (KEGG)	3	115	**0.00033**
Adhesion (KEGG)	4	312	**0.00049**
Actin (KEGG)	4	317	**0.00052**
Apoptosis (KEGG)	3	134	**0.00052**
Smooth muscle (KEGG)	3	150	**0.00072**
T cell (KEGG)	3	172	**0.0011**
Ubiquitin (KEGG)	3	184	**0.0013**
Axon (KEGG)	3	197	**0.0016**
Taste (KEGG)	2	56	**0.0019**
Huntington (KEGG)	3	212	**0.0019**

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Notch (KEGG)	2	62	**0.0024**
PDGF (Reactome)	2	62	**0.0024**
Thyroid cancer (KEGG)	2	62	**0.0024**
Endometrial cancer (KEGG)	2	73	**0.0033**
Ins receptor (Reactome)	2	76	**0.0035**
Opioid (Reactome)	2	79	**0.0038**
Basal carcinoma (KEGG)	2	79	**0.0038**
NSCLC (KEGG)	2	80	**0.0039**
Glioma (KEGG)	2	97	**0.0057**
Myocarditis (KEGG)	2	98	**0.0058**
Renal cancer (KEGG)	2	99	**0.0059**
VEGF (KEGG)	2	106	**0.0068**
Fc-gamma (KEGG)	2	124	**0.0091**
Prostate cancer (KEGG)	2	127	**0.0096**
Toll-like (KEGG)	2	145	0.012
Parkinson (KEGG)	2	153	0.014
NK cell (KEGG)	2	189	0.02
INS (KEGG)	2	196	0.022
Alzheimer (KEGG)	2	227	0.028
Allograft (KEGG)	1	48	0.054
Wnt (Reactome)	1	56	0.062
GVH (KEGG)	1	58	0.065
Bladder cancer (KEGG)	1	61	0.068
Diabetes I (KEGG)	1	61	0.068
Autoimmune-thyroid (KEGG)	1	63	0.07
DNA-sensing (KEGG)	1	63	0.07
Notch (SignaLink)	1	64	0.071
MTOR (KEGG)	1	78	0.086
Diabetes II (KEGG)	1	78	0.086
ALS (KEGG)	1	83	0.091
AML (KEGG)	1	84	0.092
RIG-I-like (KEGG)	1	87	0.095
Cholerae infection (KEGG)	1	93	0.1
Adipocytokine (KEGG)	1	95	0.1
Melanoma (KEGG)	1	95	0.1
Antigen (KEGG)	1	108	0.12
ARVC (KEGG)	1	113	0.12
B cell (KEGG)	1	118	0.13
SCLC (KEGG)	1	128	0.14
NHR (SignaLink)	1	132	0.14
Spliceosome (KEGG)	1	148	0.16
JAK-STAT (SignaLink)	1	258	0.26
Olfactory (KEGG)	1	293	0.29
Neuractive (KEGG)	1	322	0.31
Cytokine (KEGG)	1	323	0.31

Explanation of the p-values:

The hypothesis (this is tested)

We compare two groups of proteins: (a) the proteins selected in your query and their first neighbor interactors

(i.e., the proteins displayed in the network on the first page of this report) and (b) the set of all proteins of the selected organism. For each signaling pathway, s, taken from the selected signaling pathway sources we test the following hypothesis: Members of s are overrepresented in set (a) compared to set (b).

The null hypothesis (reference)

As a null hypothesis we assume that the the sets (a) and s are selected independently. In other words, for the statistical control of set (a) we consider all allowed sets of proteins with equal weight, without a bias toward the signaling pathway s.

Testing the hypothesis

Denote the number of proteins in group (a) by N_a and the number of proteins in group (b) by N_b (note: $N_b \gg N_a$). Test the above hypothesis for each signaling pathway, s, containing at least one protein from group (a). Denote the number of proteins contained by both s and (a) by $n_{a,s}$. Define $n_{b,s}$ similarly. Next, select randomly N_a proteins from group (b) and count how many of the $n_{b,s}$ pathway member proteins are within this selection. If $0 \leq n_{a,s} \leq N_a$, then the probability of having exactly $n_{a,s}$ pathway member proteins in the random selection (which has size N_a) is, according to the hypergeometric distribution,

$$\binom{N_b}{N_a}^{-1} \binom{n_{b,s}}{n_{a,s}} \binom{N_b - n_{b,s}}{N_a - n_{a,s}}.$$

The probability of observing the actual $n_{a,s}$ value or a larger one is the p-value of observing the actual $n_{a,s}$ value:

$$\sum_{x=n_{a,s}}^{\min(N_a,\, n_{b,s})} \binom{N_b}{N_a}^{-1} \binom{n_{b,s}}{x} \binom{N_b - n_{b,s}}{N_a - x}.$$

This is the p-value used in the report of PathwayLinker.

Interactions of the queried proteins. In the right column of the table click on the letter [P] after a protein to view the PubMed abstracts of the articles providing evidence for the interaction of that protein with the queried protein in the left column of the same row.

Interactors of RASGRF2 (O14827)	RASGRF2 (O14827) [P], EPPK1 (P58107) [P], PMVK (Q15126) [P], PANK2 (Q9BZ23) [P]
Interactors of GPR75 (O95800)	
Interactors of CKMT2 (P17540)	CKMT2 (P17540) [P], UNC119 (Q13432) [P], C1orf103 (Q5T3J3) [P], OLFML3 (Q9NRN5) [P]
Interactors of EIF2S2 (P20042)	TP53 (P04637) [P], EIF2S1 (P05198) [P], NCK1 (P16333) [P], APLP1 (P51693) [P], EIF5 (P55010) [P], CSNK2B (P67870) [P], CSNK2A1 (P68400) [P], PRKDC (P78527) [P], TLE1 (Q04724) [P], ZBTB16 (Q05516) [P], EIF2B5 (Q13144) [P], UNC119 (Q13432) [P], CRMP1 (Q14194) [P], EIF2B1 (Q14232) [P], CCDC90B (Q9GZT6) [P], EIF2B3 (Q9NR50) [P], KIAA1377 (Q9P2H0) [P], EIF2B4 (Q9UI10) [P], PLEKHM1 (Q9Y4G2) [P]
Interactors of AHCY (P23526)	HLA-B (P01889) [P], AHCY (P23526) [P], PINX1 (Q96BK5) [P]
Interactors of PSME4 (Q14997)	
Interactors of TMEM35 (Q53FP2)	
Interactors of CNTN4 (Q8IWV2)	CNTN4 (Q8IWV2) [P]

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Interactors of ZC-CHC9 (Q8N567)	
Interactors of PARD3 (Q8TEW0)	SMAD7 (O15105) [P], PRKCG (P05129) [P], YWHAB (P31946) [P], SFN (P31947) [P], PRKCI (P41743) [P], JAM2 (P57087) [P], CDC42 (P60953) [P], YWHAG (P61981) [P], YWHAZ (P63104) [P], DYNLL1 (P63167) [P], SMAD3 (P84022) [P], PLCB3 (Q01970) [P], YWHAH (Q04917) [P], PRKCZ (Q05513) [P], TIAM1 (Q13009) [P], SMAD4 (Q13485) [P], PVRL1 (Q15223) [P], SMAD2 (Q15796) [P], STK11 (Q15831) [P], INSC (Q1MX18) [P], TIAM2 (Q8IVF5) [P], PNMA1 (Q8ND90) [P], PARD3 (Q8TEW0) [P], JAM3 (Q9BX67) [P], PARD6G (Q9BYG4) [P], PARD6B (Q9BYG5) [P], ECT2 (Q9H8V3) [P], PARD6A (Q9NPB6) [P], PLCB1 (Q9NQ66) [P], PVRL3 (Q9NQS3) [P], F11R (Q9Y624) [P]
Interactors of CHAC2 (Q8WUX2)	
Interactors of ACOT12 (Q8WYK0)	
Interactors of CENPI (Q92674)	
Interactors of ERLEC1 (Q96DZ1)	
Interactors of TRMT2B (Q96GJ1)	
Interactors of ITCH (Q96J02)	TP73 (O15350) [P], CFLAR (O15519) [P], N4BP1 (O75113) [P], TP53 (P04637) [P], JUN (P05412) [P], SFN (P31947) [P], ARRB2 (P32121) [P], ARR3 (P36575) [P], SCNN1A (P37088) [P], YAP1 (P46937) [P], ARRB1 (P49407) [P], NUMB (P49757) [P], SCNN1B (P51168) [P], ATN1 (P54259) [P], CXCR4 (P61073) [P], UBC (P62988) [P], UBE2L3 (P68036) [P], RIPK1 (Q13546) [P], NEDD9 (Q14511) [P], ERBB4 (Q15303) [P], NFE2 (Q16621) [P], DTX1 (Q86Y01) [P], USP13 (Q92995) [P], USP9X (Q93008) [P], ITCH (Q96J02) [P], RNF11 (Q9Y3C5) [P]
Interactors of CDK19 (Q9BWU1)	MED19 (A0JLT2) [P], EIF3F (O00303) [P], MED26 (O95402) [P], SFRS7 (Q16629) [P], RB1CC1 (Q8TDY2) [P], MED10 (Q9BTT4) [P], MED28 (Q9H204) [P], MED9 (Q9NWA0) [P], MED29 (Q9NX70) [P]
Interactors of ASB3 (Q9Y575)	S100A8 (P05109) [P], S100A9 (P06702) [P], CUL5 (Q93034) [P]
Interactors of SOX21 (Q9Y651)	

The queried proteins function in the following signaling pathways

Signaling pathways of RASGRF2 (O14827)	**KEGG:** MAPK. **Reactome:** GPCR, NGF, Rho GTPases.
Signaling pathways of GPR75 (O95800)	–
Signaling pathways of CKMT2 (P17540)	–
Signaling pathways of EIF2S2 (P20042)	–
Signaling pathways of AHCY (P23526)	–
Signaling pathways of PSME4 (Q14997)	**KEGG:** Proteasome.
Signaling pathways of TMEM35 (Q53FP2)	–

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Signaling pathways of CNTN4 (Q8IWV2)	–
Signaling pathways of ZCCHC9 (Q8N567)	–
Signaling pathways of PARD3 (Q8TEW0)	**KEGG:** Adherens junction, Chemokine, Endocytosis, Neuractive, Tight junction.
Signaling pathways of CHAC2 (Q8WUX2)	–
Signaling pathways of ACOT12 (Q8WYK0)	–
Signaling pathways of CENPI (Q92674)	–
Signaling pathways of ERLEC1 (Q96DZ1)	–
Signaling pathways of TRMT2B (Q96GJ1)	–
Signaling pathways of ITCH (Q96J02)	**KEGG:** Endocytosis, Ubiquitin. **SignaLink:** TGF-beta.
Signaling pathways of CDK19 (Q9BWU1)	–
Signaling pathways of ASB3 (Q9Y575)	–
Signaling pathways of SOX21 (Q9Y651)	–

The queried proteins and their first neighbor interactors function in the following signaling pathways

Proteins in ALS (KEGG)	TP53 (P04637)
Proteins in AML (KEGG)	ZBTB16 (Q05516)
Proteins in ARVC (KEGG)	CTNNB1 (P35222)
Proteins in Actin (KEGG)	CSK (P41240), CDC42 (P60953), TIAM1 (Q13009), TIAM2 (Q8IVF5)
Proteins in Adherens junction (KEGG)	CTNNB1 (P35222), CDC42 (P60953), CSNK2B (P67870), CSNK2A1 (P68400), SMAD3 (P84022), SMAD4 (Q13485), PVRL1 (Q15223), SMAD2 (Q15796), PARD3 (Q8TEW0), PVRL3 (Q9NQS3)
Proteins in Adhesion (KEGG)	PRKCG (P05129), JUN (P05412), CTNNB1 (P35222), CDC42 (P60953)
Proteins in Adipocytokine (KEGG)	STK11 (Q15831)
Proteins in Allograft (KEGG)	HLA-B (P01889)
Proteins in Alzheimer (KEGG)	PLCB3 (Q01970), PLCB1 (Q9NQ66)
Proteins in Antigen (KEGG)	HLA-B (P01889)
Proteins in Apoptosis (KEGG)	CFLAR (O15519), TP53 (P04637), RIPK1 (Q13546)
Proteins in Autoimmune-thyroid (KEGG)	HLA-B (P01889)
Proteins in Axon (KEGG)	NCK1 (P16333), CDC42 (P60953), CXCR4 (P61073)
Proteins in B cell (KEGG)	JUN (P05412)
Proteins in Basal carcinoma (KEGG)	TP53 (P04637), CTNNB1 (P35222)
Proteins in Bladder cancer (KEGG)	TP53 (P04637)
Proteins in CAM (KEGG)	HLA-B (P01889), CDH5 (P33151), JAM2 (P57087), PVRL1 (Q15223), JAM3 (Q9BX67), PVRL3 (Q9NQS3), F11R (Q9Y624)

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Proteins in CML (KEGG)	TP53 (P04637), SMAD3 (P84022), SMAD4 (Q13485)
Proteins in Calcium (KEGG)	PRKCG (P05129), PLCB3 (Q01970), ERBB4 (Q15303), PLCB1 (Q9NQ66)
Proteins in Cancer (KEGG)	TP53 (P04637), PRKCG (P05129), JUN (P05412), CTNNB1 (P35222), CDC42 (P60953), SMAD3 (P84022), ZBTB16 (Q05516), SMAD4 (Q13485), SMAD2 (Q15796)
Proteins in Cell cycle (KEGG)	TP53 (P04637), YWHAB (P31946), SFN (P31947), CDK7 (P50613), YWHAG (P61981), YWHAZ (P63104), PRKDC (P78527), SMAD3 (P84022), YWHAH (Q04917), SMAD4 (Q13485), SMAD2 (Q15796)
Proteins in Chemokine (KEGG)	ARRB2 (P32121), CSK (P41240), ARRB1 (P49407), CDC42 (P60953), CXCR4 (P61073), PLCB3 (Q01970), PRKCZ (Q05513), TIAM1 (Q13009), TIAM2 (Q8IVF5), PARD3 (Q8TEW0), PLCB1 (Q9NQ66)
Proteins in Cholerae infection (KEGG)	PRKCG (P05129)
Proteins in Colorectal cancer (KEGG)	TP53 (P04637), JUN (P05412), CTNNB1 (P35222), SMAD3 (P84022), SMAD4 (Q13485), SMAD2 (Q15796)
Proteins in Cytokine (KEGG)	CXCR4 (P61073)
Proteins in DNA-sensing (KEGG)	RIPK1 (Q13546)
Proteins in Depression (KEGG)	PRKCG (P05129), PLCB3 (Q01970), PLCB1 (Q9NQ66)
Proteins in Diabetes I (KEGG)	HLA-B (P01889)
Proteins in Diabetes II (KEGG)	PRKCZ (Q05513)
Proteins in E.coli infection (KEGG)	NCK1 (P16333), CTNNB1 (P35222), CDC42 (P60953), YWHAZ (P63104)
Proteins in Endocytosis (KEGG)	SMAD7 (O15105), HLA-B (P01889), ARRB2 (P32121), PRKCI (P41743), ARRB1 (P49407), CDC42 (P60953), CXCR4 (P61073), SMAD3 (P84022), PRKCZ (Q05513), ERBB4 (Q15303), SMAD2 (Q15796), PARD3 (Q8TEW0), ITCH (Q96J02), PARD6G (Q9BYG4), PARD6B (Q9BYG5), PARD6A (Q9NPB6)
Proteins in Endometrial cancer (KEGG)	TP53 (P04637), CTNNB1 (P35222)
Proteins in ErbB (KEGG)	PRKCG (P05129), JUN (P05412), NCK1 (P16333), ERBB4 (Q15303)
Proteins in Fc-gamma (KEGG)	PRKCG (P05129), CDC42 (P60953)
Proteins in GVH (KEGG)	HLA-B (P01889)
Proteins in Gap junction (KEGG)	PRKCG (P05129), PLCB3 (Q01970), PLCB1 (Q9NQ66)
Proteins in Glioma (KEGG)	TP53 (P04637), PRKCG (P05129)
Proteins in GnRH (KEGG)	JUN (P05412), CDC42 (P60953), PLCB3 (Q01970), PLCB1 (Q9NQ66)
Proteins in Helicobacter infection (KEGG)	JUN (P05412), CSK (P41240), JAM2 (P57087), CDC42 (P60953), JAM3 (Q9BX67), F11R (Q9Y624)
Proteins in Huntington (KEGG)	TP53 (P04637), PLCB3 (Q01970), PLCB1 (Q9NQ66)
Proteins in INS (KEGG)	PRKCI (P41743), PRKCZ (Q05513)
Proteins in LTP (KEGG)	PRKCG (P05129), PLCB3 (Q01970), PLCB1 (Q9NQ66)
Proteins in Leukocyte (KEGG)	PRKCG (P05129), CDH5 (P33151), CTNNB1 (P35222), JAM2 (P57087), CDC42 (P60953), CXCR4 (P61073), JAM3 (Q9BX67), F11R (Q9Y624)
Proteins in MAPK (KEGG)	RASGRF2 (O14827), TP53 (P04637), PRKCG (P05129), JUN (P05412), ARRB2 (P32121), ARRB1 (P49407), CDC42 (P60953)
Proteins in MTOR (KEGG)	STK11 (Q15831)

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Proteins in Melanogenesis (KEGG)	PRKCG (P05129), CTNNB1 (P35222), PLCB3 (Q01970), PLCB1 (Q9NQ66)
Proteins in Melanoma (KEGG)	TP53 (P04637)
Proteins in Myocarditis (KEGG)	HLA-B (P01889), EIF4G2 (P78344)
Proteins in NK cell (KEGG)	HLA-B (P01889), PRKCG (P05129)
Proteins in NSCLC (KEGG)	TP53 (P04637), PRKCG (P05129)
Proteins in NT (KEGG)	TP73 (O15350), TP53 (P04637), JUN (P05412), YWHAB (P31946), CSK (P41240), CDC42 (P60953), YWHAG (P61981), YWHAZ (P63104), YWHAH (Q04917)
Proteins in Neuractive (KEGG)	PARD3 (Q8TEW0)
Proteins in Notch (KEGG)	NUMB (P49757), DTX1 (Q86Y01)
Proteins in Olfactory (KEGG)	ARRB2 (P32121)
Proteins in P53 (KEGG)	TP73 (O15350), TP53 (P04637), SFN (P31947)
Proteins in Pancreatic cancer (KEGG)	TP53 (P04637), CDC42 (P60953), SMAD3 (P84022), SMAD4 (Q13485), SMAD2 (Q15796)
Proteins in Parkinson (KEGG)	TH (P07101), UBE2L3 (P68036)
Proteins in Prostate cancer (KEGG)	TP53 (P04637), CTNNB1 (P35222)
Proteins in Proteasome (KEGG)	PSME4 (Q14997)
Proteins in PtdIns (KEGG)	PRKCG (P05129), PLCB3 (Q01970), PLCB1 (Q9NQ66)
Proteins in RIG-I-like (KEGG)	RIPK1 (Q13546)
Proteins in Renal cancer (KEGG)	JUN (P05412), CDC42 (P60953)
Proteins in SCLC (KEGG)	TP53 (P04637)
Proteins in Smooth muscle (KEGG)	PRKCG (P05129), PLCB3 (Q01970), PLCB1 (Q9NQ66)
Proteins in Spliceosome (KEGG)	SFRS7 (Q16629)
Proteins in T cell (KEGG)	JUN (P05412), NCK1 (P16333), CDC42 (P60953)
Proteins in TGF (KEGG)	SMAD7 (O15105), SMAD3 (P84022), SMAD4 (Q13485), SMAD2 (Q15796)
Proteins in Taste (KEGG)	SCNN1A (P37088), SCNN1B (P51168)
Proteins in Thyroid cancer (KEGG)	TP53 (P04637), CTNNB1 (P35222)
Proteins in Tight junction (KEGG)	PRKCG (P05129), CTNNB1 (P35222), PRKCI (P41743), JAM2 (P57087), CDC42 (P60953), CSNK2B (P67870), CSNK2A1 (P68400), PRKCZ (Q05513), INADL (Q8NI35), PARD3 (Q8TEW0), JAM3 (Q9BX67), PARD6G (Q9BYG4), PARD6B (Q9BYG5), PARD6A (Q9NPB6), F11R (Q9Y624)
Proteins in Toll-like (KEGG)	JUN (P05412), RIPK1 (Q13546)
Proteins in Ubiquitin (KEGG)	UBE2L3 (P68036), CUL5 (Q93034), ITCH (Q96J02)
Proteins in VEGF (KEGG)	PRKCG (P05129), CDC42 (P60953)
Proteins in WNT (KEGG)	TP53 (P04637), PRKCG (P05129), JUN (P05412), CTNNB1 (P35222), CSNK2B (P67870), CSNK2A1 (P68400), SMAD3 (P84022), PLCB3 (Q01970), SMAD4 (Q13485), SMAD2 (Q15796), PLCB1 (Q9NQ66)
Proteins in BMP (Reactome)	SMAD7 (O15105), SMAD4 (Q13485)
Proteins in EGFR (Reactome)	YWHAB (P31946), CSK (P41240), CDC42 (P60953)
Proteins in GPCR (Reactome)	RASGRF2 (O14827), CDC42 (P60953), CXCR4 (P61073), PLCB3 (Q01970), TIAM1 (Q13009), TIAM2 (Q8IVF5), ECT2 (Q9H8V3), PLCB1 (Q9NQ66)
Proteins in Immune (Reactome)	HLA-B (P01889), JUN (P05412), NCK1 (P16333), CSK (P41240), JAM2 (P57087), CDC42 (P60953), RIPK1 (Q13546), JAM3 (Q9BX67), F11R (Q9Y624)

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Proteins in Ins receptor (Reactome)	YWHAB (P31946), STK11 (Q15831)
Proteins in NGF (Reactome)	RASGRF2 (O14827), YWHAB (P31946), PRKCI (P41743), TIAM1 (Q13009), TIAM2 (Q8IVF5), ECT2 (Q9H8V3)
Proteins in Opioid (Reactome)	PLCB3 (Q01970), PLCB1 (Q9NQ66)
Proteins in PDGF (Reactome)	NCK1 (P16333), YWHAB (P31946)
Proteins in Rho GTPases (Reactome)	RASGRF2 (O14827), CDC42 (P60953), TIAM1 (Q13009), TIAM2 (Q8IVF5), ECT2 (Q9H8V3)
Proteins in TGF beta (Reactome)	SMAD7 (O15105), SMAD3 (P84022), SMAD4 (Q13485), SMAD2 (Q15796)
Proteins in Wnt (Reactome)	CTNNB1 (P35222)
Proteins in EGF/MAPK (SignaLink)	SMAD7 (O15105), SMAD3 (P84022), SMAD4 (Q13485), ERBB4 (Q15303), STK11 (Q15831)
Proteins in JAK-STAT (SignaLink)	ERBB4 (Q15303)
Proteins in NHR (SignaLink)	SMAD3 (P84022)
Proteins in Notch (SignaLink)	DTX1 (Q86Y01)
Proteins in TGF-beta (SignaLink)	SMAD7 (O15105), CTNNB1 (P35222), SMAD3 (P84022), SMAD4 (Q13485), ITCH (Q96J02)
Proteins in WNT (SignaLink)	YWHAB (P31946), CTNNB1 (P35222), SMAD3 (P84022), STK11 (Q15831)