reactome

# vWAT-MSC secretome from ND mice
# Pathway Analysis Report

## Table of Contents

# 1. Introduction

Reactome is a curated database of pathways and reactions in human biology. Reactions can be considered as pathway 'steps'. Reactome defines a 'reaction' as any event in biology that changes the state of a biological molecule. Binding, activation, translocation, degradation and classical biochemical events involving a catalyst are all reactions. Information in the database is authored by expert biologists, entered and maintained by Reactome's team of curators and editorial staff. Reactome content frequently cross-references other resources e.g. NCBI, Ensembl, UniProt, KEGG (Gene and Compound), ChEBI, PubMed and GO. Orthologous reactions inferred from annotation for Homo sapiens are available for 17 non-human species including mouse, rat, chicken, puffer fish, worm, fly, yeast, rice, and Arabidopsis. Pathways are represented by simple diagrams following an SBGN-like format.

Reactome's annotated data describe reactions possible if all annotated proteins and small molecules were present and active simultaneously in a cell. By overlaying an experimental dataset on these annotations, a user can perform a pathway over-representation analysis. By overlaying quantitative expression data or time series, a user can visualize the extent of change in affected pathways and its progression. A binomial test is used to calculate the probability shown for each result, and the p-values are corrected for the multiple testing (Benjamini–Hochberg procedure) that arises from evaluating the submitted list of identifiers against every pathway.

To learn more about our Pathway Analysis, please have a look at our relevant publications:

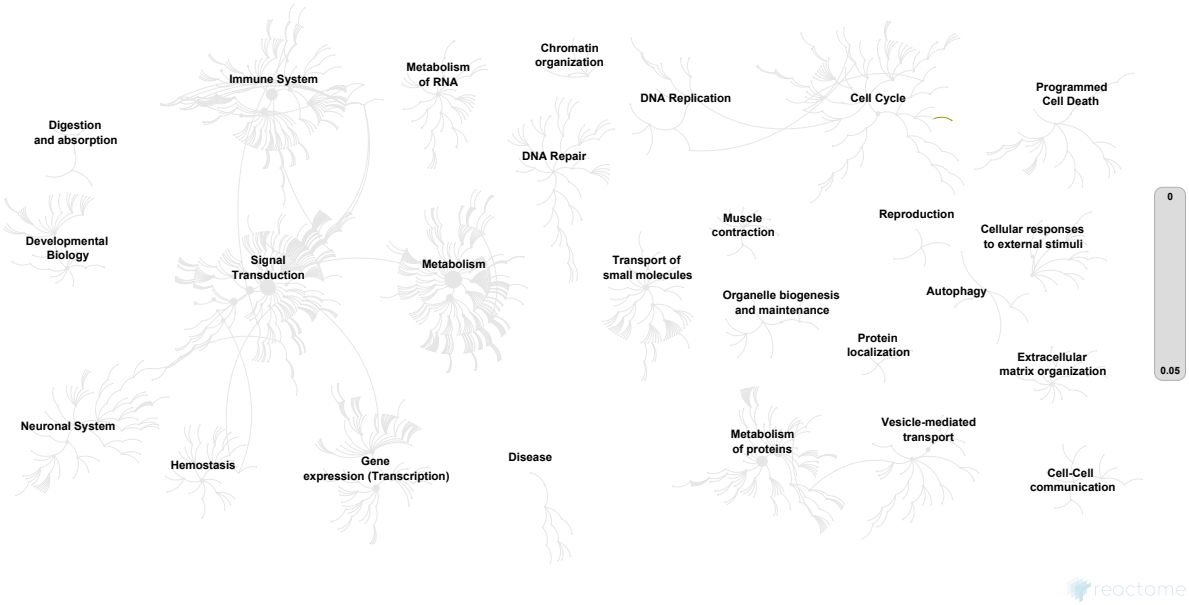
Fabregat A, Sidiropoulos K, Garapati P, Gillespie M, Hausmann K, Haw R, … D'Eustachio P (2016). The reactome pathway knowledgebase. Nucleic Acids Research, 44(D1), D481–D487. https://doi.org/10.1093/nar/gkv1351.

Fabregat A, Sidiropoulos K, Viteri G, Forner O, Marin-Garcia P, Arnau V, … Hermjakob H (2017). Reactome pathway analysis: a high-performance in-memory approach. BMC Bioinformatics, 18.

## 2. Properties

- This is an **overrepresentation** analysis: A statistical (hypergeometric distribution) test that determines whether certain Reactome pathways are over-represented (enriched) in the submitted data. It answers the question 'Does my list contain more proteins for pathway X than would be expected by chance?' This test produces a probability score, which is corrected for false discovery rate using the Benjamani-Hochberg method.
- 320 out of 339 identifiers in the sample were found in Reactome, where 9055 pathways were hit by at least one of them.
- IntAct interactors were included to increase the analysis background. This greatly increases the size of Reactome pathways, which maximises the chances of matching your submitted identifiers to the expanded pathway, but will include interactors that have not undergone manual curation by Reactome and may include interactors that have no biological significance, or unexplained relevance.
- This report is filtered to show only results for species 'Mus musculus' and resource 'all resources'.
- The unique ID for this analysis (token) is MjAyMDAzMjQxMjA1MDZfMzE3OA%3D%3D. This ID is valid for at least 7 days in Reactome's server. Use it to access Reactome services with your data.

# 3. Genome-wide overview




This figure shows a genome-wide overview of the results of your pathway analysis. Reactome pathways are arranged in a hierarchy. The center of each of the circular "bursts" is the root of one top-level pathway, for example "DNA Repair". Each step away from the center represents the next level lower in the pathway hierarchy. The color code denotes over-representation of that pathway in your input dataset. Light grey signifies pathways which are not significantly over-represented.

# 4. Most significant pathways

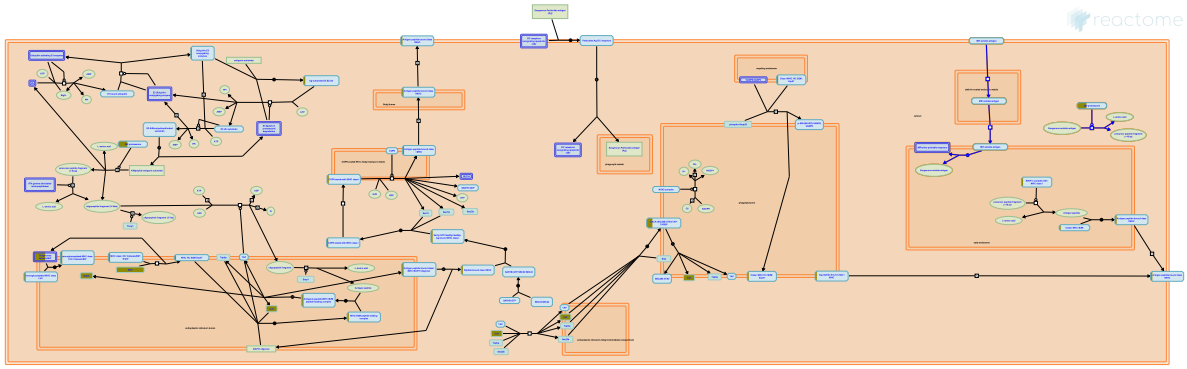
The following table shows the 25 most relevant pathways sorted by p-value.

| Pathway name | Entities | | | | Reactions | |
|---|---|---|---|---|---|---|
| | found | ratio | p-value | FDR* | found | ratio |
| Chk1/Chk2(Cds1) mediated inactivation of Cyclin B:Cdk1 complex | 6 / 14 | 0.001 | 0.044 | 1 | 1 / 4 | 5.13e-04 |
| HSF1 activation | 5 / 11 | 9.09e-04 | 0.052 | 1 | 5 / 6 | 7.69e-04 |
| Regulation of ornithine decarboxylase (ODC) | 14 / 50 | 0.004 | 0.077 | 1 | 1 / 4 | 5.13e-04 |
| Cross-presentation of soluble exogenous antigens (endosomes) | 14 / 51 | 0.004 | 0.086 | 1 | 1 / 4 | 5.13e-04 |
| Regulation of RUNX2 expression and activity | 14 / 52 | 0.004 | 0.097 | 1 | 1 / 5 | 6.41e-04 |
| Ubiquitin-dependent degradation of Cyclin D | 14 / 53 | 0.004 | 0.108 | 1 | 1 / 3 | 3.84e-04 |
| Ubiquitin Mediated Degradation of Phosphorylated Cdc25A | 14 / 53 | 0.004 | 0.108 | 1 | 1 / 3 | 3.84e-04 |
| p53-Independent DNA Damage Response | 14 / 53 | 0.004 | 0.108 | 1 | 1 / 3 | 3.84e-04 |
| p53-Independent G1/S DNA damage checkpoint | 14 / 53 | 0.004 | 0.108 | 1 | 1 / 3 | 3.84e-04 |
| Platelet degranulation | 30 / 131 | 0.011 | 0.12 | 1 | 5 / 8 | 0.001 |
| Autodegradation of the E3 ubiquitin ligase COP1 | 14 / 54 | 0.004 | 0.12 | 1 | 1 / 5 | 6.41e-04 |
| CDT1 association with the CDC6:ORC:origin complex | 14 / 59 | 0.005 | 0.191 | 1 | 1 / 3 | 3.84e-04 |
| Degradation of AXIN | 14 / 59 | 0.005 | 0.191 | 1 | 2 / 8 | 0.001 |
| Dectin-1 mediated noncanonical NF-kB signaling | 14 / 59 | 0.005 | 0.191 | 1 | 1 / 8 | 0.001 |
| NIK-->noncanonical NF-kB signaling | 14 / 59 | 0.005 | 0.191 | 1 | 1 / 9 | 0.001 |
| AUF1 (hnRNP D0) binds and destabilizes mRNA | 16 / 64 | 0.005 | 0.193 | 1 | 3 / 4 | 5.13e-04 |
| Post-translational protein phosphorylation | 25 / 114 | 0.009 | 0.195 | 1 | 1 / 1 | 1.28e-04 |
| Regulation of Insulin-like Growth Factor (IGF) transport and uptake by Insulin-like Growth Factor Binding Proteins (IGFBPs) | 26 / 120 | 0.01 | 0.206 | 1 | 6 / 6 | 7.69e-04 |
| Degradation of GLI1 by the proteasome | 15 / 61 | 0.005 | 0.224 | 1 | 2 / 5 | 6.41e-04 |
| FBXL7 down-regulates AURKA during mitotic entry and in early mitosis | 15 / 62 | 0.005 | 0.241 | 1 | 3 / 6 | 7.69e-04 |

| Pathway name | Entities | | | | Reactions | |
|---|---|---|---|---|---|---|
| | found | ratio | p-value | FDR* | found | ratio |
| Autodegradation of Cdh1 by Cdh1:APC/C | 14 / 62 | 0.005 | 0.241 | 1 | 1 / 2 | 2.56e-04 |
| Asymmetric localization of PCP proteins | 14 / 62 | 0.005 | 0.241 | 1 | 1 / 4 | 5.13e-04 |
| SCF(Skp2)-mediated degradation of p27/p21 | 14 / 62 | 0.005 | 0.241 | 1 | 1 / 7 | 8.97e-04 |
| Activation of BAD and translocation to mitochondria | 8 / 23 | 0.002 | 0.242 | 1 | 4 / 4 | 5.13e-04 |
| The role of GTSE1 in G2/M progression after G2 checkpoint | 17 / 79 | 0.007 | 0.272 | 1 | 5 / 10 | 0.001 |

* False Discovery Rate

## 4. Cross-presentation of soluble exogenous antigens (endosomes) (R-MMU-1236978)



**Inferred from:** Cross-presentation of soluble exogenous antigens (endosomes).

This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

More details and caveats of the event inference in Reactome. For details on PANTHER see also: http://www.pantherdb.org/about.jsp

### References

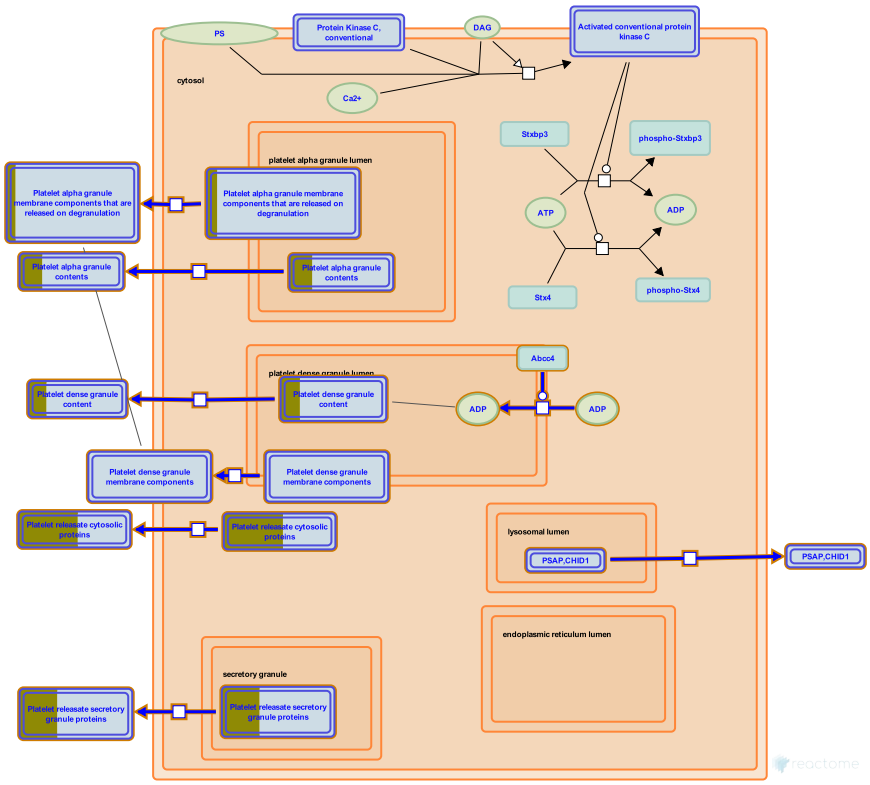
### Edit history

| Date | Action | Author |
|---|---|---|
| 2020-03-08 | Created | Cook J |

### Entities found in this pathway (14)

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| Psma1 | Q9R1P4 | Psma2 | P49722 | Psma3 | O70435 |
| Psma4 | Q9R1P0 | Psma5 | Q9Z2U1 | Psma6 | Q9QUM9 |
| Psma7 | Q9Z2U0 | Psmb1 | O09061 | Psmb2 | Q9R1P3 |
| Psmb3 | Q9R1P1 | Psmb4 | P99026 | Psmb5 | O55234 |
| Psmb8 | P28063 | Psme1 | P97371 | | |

## 10. Platelet degranulation (R-MMU-114608)




**Inferred from:** Platelet degranulation .

This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

More details and caveats of the event inference in Reactome. For details on PANTHER see also: http://www.pantherdb.org/about.jsp

### References

### Edit history

| Date | Action | Author |
|---|---|---|
| 2020-03-08 | Created | Cook J |

### Entities found in this pathway (30)

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| A2m | Q6GQT1 | Actg1 | P63260 | Actn1 | Q7TPR4 |
| Ahsg | P29699 | Alb | P07724 | Aldoa | P05064 |
| Anxa5 | P48036 | Apoh | Q01339 | Calm1 | P0DP26 |
| Ecm1 | Q61508 | Flna | Q8BTM8 | Fn1 | P11276 |
| Igf2 | P09535 | Itih4 | A6X935 | Lgals3bp | Q07797 |

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| Plg | P20918 | Qsox1 | Q8BND5 | Serpine1 | P22777 |
| Serping1 | P97290 | Sod1 | P08228 | Sparc | P07214 |
| Sytl4 | Q9R0Q1 | Tagln2 | Q9WVA4 | Tf | Q921I1 |
| Thbs1 | P35441 | Timp1 | P12032 | Tln1 | P26039 |
| Tmsb4x | P20065 | Vcl | Q64727 | Wdr1 | O88342 |

# 6. Identifiers found

Below is a list of the input identifiers that have been found or mapped to an equivalent element in Reactome, classified by resource.

### Entities (320)

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| A2m | P01023 | Acta2 | P62737 | Actb | P60709 |
| Actg1 | P63260 | Actn1 | P12814 | Actr2 | P61160 |
| Actr3 | F1P679 | Ahcy | P23526 | Ahsg | P02765 |
| Ak2 | P54819 | Akr1a1 | P14550 | Akr1b1 | P15121 |
| Alb | P02768 | Aldoa | P04075 | Anxa1 | P04083 |
| Anxa2 | P07355 | Anxa4 | Q804G7 | Anxa5 | P08758 |
| Apoe | P02649 | Apoh | P02749 | Arhgdia | F1PL93 |
| Arhgdib | P52566 | Arpc1b | E2RMT4 | Arpc2 | F1PAG6 |
| Arpc3 | E2R985 | Arpc4 | E2QWU0 | Arpc5 | O15511 |
| Asah1 | Q13510 | Asl | P04424 | Atic | P31335 |
| Atox1 | Q9TT99 | Atp5f1a | P25705 | Atp5f1b | J9NT37 |
| Atp5f1d | P30049 | Atp6v1a | P38606 | B2m | P61769 |
| Bgn | P28653 | Blvra | P53004 | Blvrb | P30043 |
| C1qa | E1BSP0 | C1qc | P02747 | C1ra | Q8CG16 |
| C3 | P01024 | Calm1 | P0DP23 | Calr | P27797 |
| Calu | O43852 | Cap1 | Q01518 | Capg | Q9BPX3 |
| Cat | P04040 | Ccn1 | O00622 | Ccn2 | P29279 |
| Cd14 | P08571 | Cdh11 | P55288 | Cdh2 | P19022 |
| Cep162 | Q5TB80 | Cfl1 | P23528 | Cfp | P27918 |
| Chmp4b | Q7ZVC4 | Ckb | P12277 | Cmpk1 | P30085 |
| Cndp2 | Q96KP4 | Cnn2 | Q99439 | Col12a1 | Q99715 |
| Col1a1 | P02453 | Col1a2 | P02465 | Col2a1 | P02458 |
| Col3a1 | P02461 | Col5a2 | P05997 | Col6a1 | P12109 |
| Comp | Q9R0G6 | Coro1a | P31146 | Csf1 | P09603 |
| Csf1r | A7Z067 | Csrp1 | P21291 | Cst3 | P01034 |
| Cstb | P04080 | Ctsa | P10619 | Ctsb | P07858 |
| Ctsd | P07339 | Ctsl | P07711 | Ctss | P25774 |
| Ctsz | Q9UBR2 | Cycs | P99999 | Dbi | P07108 |
| Dld | P09622 | Dpysl2 | P47942 | Ecm1 | Q16610 |
| Eef1a1 | P62630 | Eef1b | P24534 | Eef1g | P26641 |
| Eef2 | P13639 | Efhd2 | F1SUW2 | Eif2s1 | P05198 |
| Eif4b | P23588 | Eif5a | P63241 | Eno1 | P06733 |
| Ero1a | Q8R180 | F2 | P00734 | Fabp4 | P04117 |
| Fabp5 | Q01469 | Fah | P16930 | Fbln1 | P23142 |
| Fbln2 | P98095 | Fh | P07954 | Fkbp1a | P62942 |
| Flna | P21333 | Flnb | A0A0G2JXT8 | Fn1 | P02751 |
| Fscn1 | Q16658 | Fstl1 | Q12841 | Fth1 | P02794 |
| Ftl1 | P02793 | Gapdh | P04406 | Gdi1 | P31150 |
| Gdi2 | P50395 | Glud1 | P26443 | Gm20390 | E9PZF0 |
| Gm2a | P17900 | Gnpda1 | P46926 | Got1 | P17174 |
| Got2 | P00505 | Gpi | P06744 | Gpnmb | A5A766 |

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| Grn | P28799 | Gsn | P06396 | Gsr | P00390-2 |
| Gzme | P08884 | H1-4 | P10412 | H1-5 | P16401 |
| H2-D1 | P14427 | H4c1 | P62805 | H4c11 | P62805 |
| H4c12 | P62805 | H4c14 | P62805 | H4c2 | P62805 |
| H4c3 | P62805 | H4c4 | P62805 | H4c6 | P62805 |
| H4c8 | P62805 | H4c9 | P62805 | H4f16 | P62806 |
| Hba | P01966 | Hbb-bs | A8DUK4 | Hexa | P06865 |
| Hist1h4m | P62806 | Hmox1 | P09601 | Hnrnpa1 | F6XNZ3 |
| Hnrnpa2b1 | P22626 | Hprt1 | P00492 | Hsp90aa1 | P82995 |
| Hsp90ab1 | P34058 | Hsp90b1 | P14625 | Hspa4 | O88600 |
| Hspa5 | P11021 | Hspa8 | P11142 | Hspg2 | F1MER7 |
| Igf2 | P01344 | Igfbp7 | Q16270 | Impa1 | O55023 |
| Iqgap1 | P46940 | Itih2 | P19823 | Itih4 | Q14624 |
| Itm2b | Q9Y287 | Kpnb1 | Q14974 | Krt1 | P04264 |
| Krt10 | P13645 | Krt2 | P35908 | Krt5 | F1SGG6 |
| Krt73 | Q86Y46 | Krt76 | Q01546 | Krt77 | Q7Z794 |
| Krt78 | Q8N1N4 | Krt79 | Q5XKE5 | Lcp1 | P13796 |
| Ldha | P00340 | Ldhb | P00337 | Lgals1 | P09382 |
| Lgals3 | P17931 | Lgals3bp | Q08380 | Lmna | P02545 |
| Lox | P28300 | Loxl2 | Q9Y4K0 | Lpl | P11151 |
| Lrp1 | E1BGJ0 | Lum | P51884 | Lyz2 | P08905 |
| Man2b1 | O00754 | Marcks | A0A287BRL8 | Mdh1 | P40925 |
| Mdh2 | P40926 | Mfge8 | Q08431 | Mif | P14174 |
| Mmp12 | P39900 | Mmp2 | P08253 | Msn | Q9W002 |
| Mydgf | Q969H8 | Myh9 | F1MQ37 | Myl6 | P60661 |
| Naglu | P54802 | Nampt | P43490 | Ncl | P09405 |
| Nedd8 | Q71UE8 | Nid1 | P14543 | Nme1 | P15531 |
| Npc2 | P61916 | Npm1 | P13084 | Nucb1 | Q02818 |
| P4hb | P07237 | Pdia3 | F6WRR4 | Pdia6 | Q15084 |
| Pdxk | O00764 | Pea15 | Q15121 | Pebp1 | P30086 |
| Pfn1 | P07737 | Pgam1 | P18669 | Pgd | P52209 |
| Pgk1 | P00558 | Pgls | O95336 | Pgm1 | P36871 |
| Pgp | A6NDG6 | Pkm | P14618 | Plg | P00747 |
| Plod1 | Q02809 | Pnp | P00491 | Ppia | P62937 |
| Ppib | P23284 | Prdx1 | P35700 | Prdx2 | Q61171 |
| Prdx6 | P30041 | Prkcsh | P14314 | Psma1 | P25786 |
| Psma2 | P25787 | Psma3 | P25788 | Psma4 | P25789 |
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| Psmb1 | P20618 | Psmb2 | P49721 | Psmb3 | P49720 |
| Psmb4 | P28070 | Psmb5 | P28074 | Psmb8 | P28062 |
| Psme1 | Q06323 | Ptgr1 | Q14914 | Qsox1 | O00391 |
| Rac1 | P63000 | Rad23b | Q4KMA2 | Ralgapa2 | Q2PPJ7 |
| Rpl12 | P30050 | Rpl14 | P50914 | Rpl19 | P84098 |
| Rpl24 | P83731 | Rpl27 | P61353 | Rpl30 | P62888 |
| Rpl4 | P36578 | Rpl6 | Q02878 | Rpl7a | P62424 |
| Rpl8 | P62917 | Rplp0 | P05388 | Rplp2 | P05387 |
| Rps12 | P25398 | Rps14 | P62263 | Rps2 | P15880 |
| Rps21 | P63220 | Rps28 | P62857 | Rps8 | P62241 |
| Rpsa | P08865 | S100a11 | P31949 | Sema7a | F1NIZ9 |

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| Serpinb6a | Q6P9U0 | Serpinc1 | P01008 | Serpine1 | P05121 |
| Serpine2 | A0A287AYW8 | Serping1 | P05155 | Serpinh1 | P50454 |
| Sfpq | A0A0G2K8K0 | Snrpd3 | E2RQ80, J9P8R0 | Sod1 | P00441 |
| Sod2 | P09671 | Sparc | P09486 | Spp1 | P10451 |
| Sri | P30626 | Stip1 | P31948 | Sytl4 | Q96C24 |
| Tagln2 | P37802 | Taldo1 | P37837 | Tbca | O75347 |
| Tcn2 | P20062 | Tf | P02787 | Thbs1 | P07996 |
| Thbs2 | P35442 | Timp1 | P01033 | Timp2 | P16035 |
| Tkt | P29401 | Tln1 | Q9Y490 | Tmsb4x | P62328 |
| Tpi1 | P60174 | Tpm4 | Q6IRU2 | Try10 | Q792Z1 |
| Ttr | P02766 | Tubb4b | P68371 | Tubb5 | P07437 |
| Txn | P10639 | Txndc5 | Q8NBS9 | Txnrd1 | Q16881 |
| Ube2n | P61088 | Vapa | Q9P0L0 | Vat1 | Q99536 |
| Vcl | P18206 | Vcp | P55072 | Vim | P02543 |
| Wdr1 | O75083 | Ybx1 | P62960 | Ywhab | Q5XGC8 |
| Ywhae | P62260 | Ywhag | Q0V9W8 | Ywhah | Q28DR3 |
| Ywhaq | Q5BL40 | Ywhaz | Q6P4Z5 | | |

| Input | Ensembl Id | Input | Ensembl Id | Input | Ensembl Id |
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| Acta2 | ENSG00000107796 | Actb | ENST00000331789 | Anxa1 | ENSG00000135046 |
| Anxa2 | ENSG00000182718 | Apoe | ENSG00000130203 | Atp5f1b | ENSG00000110955 |
| B2m | ENSG00000166710 | C1qc | ENSGALP00000007599 | Calr | ENSG00000179218 |
| Cat | ENSG00000121691 | Ccn1 | ENSG00000145386 | Ccn2 | ENSG00000118523 |
| Cfl1 | ENSG00000172757 | Cnn2 | ENSG00000064666 | Col1a1 | ENSG00000108821 |
| Col1a2 | ENSG00000164692 | Csf1 | ENSG00000184371 | Csf1r | ENSG00000182578 |
| Csrp1 | ENSG00000159176 | Ctsd | ENSG00000117984 | Cycs | ENSG00000172115 |
| Fabp4 | ENSG00000170323 | Fn1 | ENSG00000115414 | Fscn1 | ENSG00000075618 |
| Fth1 | ENST00000273550 | Hmox1 | ENSG00000100292 | Hnrnpa2b1 | ENSG00000122566 |
| Hsp90aa1 | ENSG00000080824 | Hsp90b1 | ENSG00000166598 | Hspa5 | ENSG00000044574 |
| Hspa8 | ENSG00000109971 | Igf2 | ENST00000337883, ENST00000381406 | Igfbp7 | ENSG00000163453 |
| Lcp1 | ENSG00000136167 | Lgals3 | ENSG00000131981 | Lmna | ENSG00000160789 |
| Lpl | ENSG00000175445 | Mif | ENSG00000240972 | Mmp2 | ENSG00000087245 |
| Msn | ENSG00000147065 | Mydgf | ENSG00000074842 | Nampt | ENSG00000105835 |
| Pdia6 | ENSG00000143870 | Ppia | ENSG00000196262 | Psmb8 | ENSG00000204264 |
| Rplp0 | ENSG00000089157 | Serpine1 | ENSG00000106366 | Serpinh1 | ENSG00000149257 |
| Sod1 | ENSG00000142168 | Sod2 | ENSG00000112096 | Sparc | ENSG00000113140 |
| Spp1 | ENSG00000118785 | Taldo1 | ENSG00000177156 | Tf | ENSG00000117525 |
| Thbs1 | ENSG00000137801 | Timp1 | ENSG00000102265 | Tln1 | ENSG00000137076 |
| Txnrd1 | ENSG00000198431 | Vapa | ENST00000340541 | Vim | ENSG00000026025 |

## Interactors (255)

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
|---|---|---|---|---|---|
| Actb | P60709 | P13569 | Actg1 | P63261 | P23528 |
| Actn1 | P12814 | P12931 | Actr2 | A7MB62 | Q95107 |
| Actr3 | Q99JY9 | P34152 | Ahcy | P23526 | Q8IWL3 |
| Ahnak | Q09666-2 | Q5SY16 | Ahnak2 | Q8IVF2-3 | P24593 |
| Ahsg | P12763 | P17931 | Akap12 | Q02952 | P00533 |
| Alb | P02768 | P02768 | Aldoa | P05064 | P63101 |

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
|---|---|---|---|---|---|
| Anxa1 | P04083 | Q13546 | Anxa2 | EBI-8785901, P07355 | Q8NBP7 |
| Apoe | P02649 | P02649 | Apoh | P02749 | P08519 |
| Arhgdia | P52565 | P60953 | Arpc1b | O15143 | O00401 |
| Arpc3 | O15145 | P48552 | Arpc4 | P59998 | O00401 |
| Arpc5 | O15511 | P00533 | Atic | P31939 | P00533 |
| Atox1 | O00244 | P35670 | Atp5f1a | Q03265 | P63101 |
| Atp5f1b | P06576 | P05919 | Atp5f1d | P30049 | P05919 |
| Atp6v1a | P38606 | Q9H444 | B2m | P61769 | P61769 |
| Basp1 | Q91XV3 | Q62108 | Blvra | P53004 | P28482 |
| C3 | P01024-PRO_0000005911, P01024-PRO_0000005908, P01024 | P08603, P05156 | Calm1 | P62158 | P14416 |
| Calr | P27797 | P30101 | Calu | O43852 | P04049 |
| Cap1 | Q13114 | Q99558 | Capg | P40121 | Q8IUQ4 |
| Cat | P24270 | P19096 | Ccn1 | P20248 | Q9H211 |
| Ccn2 | P29279 | P02751 | Ccn5 | O76076 | P49639 |
| Cd14 | EBI-11177705, EBI-11177518 | O43474 | Cdh2 | P15116 | P18031 |
| Cep162 | Q5TB80 | Q8IW35, O43303 | Cfl1 | P23528 | P53667 |
| Cfl2 | Q549N0 | P23528 | Cfp | P27918 | O75344 |
| Chmp4b | Q9H444 | Q8WUX9, Q9Y3E7 | Col1a1 | P02452 | P02751 |
| Col3a1 | P02461-1 | P09486 | Comp | P49747 | O00244 |
| Coro1a | P31146 | P40763 | Coro1c | Q9ULV4 | P19320 |
| Csf1 | P07141 | P05480 | Csf1r | P07333 | Q8CIH5 |
| Csrp1 | P21291 | Q16790 | Ctsa | P10619 | P08670 |
| Ctsb | P07858 | P02760 | Ctsd | P07339 | P04578 |
| Cycs | P99999 | Q9Y4K3 | Dld | O08749 | Q9CQV8 |
| Dnpep | Q19087 | O17761 | Dstn | P60981 | P60709 |
| Ecm1 | Q16610 | Q9NQ94 | Eef1a1 | P68104 | Q00987 |
| Eef1b | P24534 | P26641 | Eef1g | P26641, P26641-2 | P29692, P24534 |
| Eef2 | P58252 | P63101 | Eif2s1 | P05198 | Q9Z2B5 |
| Eif4b | P23588 | P53350 | Eif5a | P63242 | P63101 |
| Eno1 | P06733 | P03496 | Ero1a | Q96HE7 | P07237 |
| Erp29 | P30040 | Q969S0 | Fabp4 | P15090 | P08670 |
| Fah | P16930 | P00533 | Fbln1 | P23142 | P02647 |
| Fbln2 | P98095 | Q9H2F3 | Fh | P07954 | P21673 |
| Fkbp1a | P62942 | P36896 | Flna | P21333 | O14786 |
| Flnb | O75369 | Q13233 | Fn1 | P02751 | P07585 |
| Fscn1 | Q16658 | P54278 | Fstl1 | Q12841 | P08571 |
| Fth1 | P02794 | P04792 | Gapdh | P04406 | P00558 |
| Gdi1 | P31150 | P51149 | Gdi2 | P50395 | Q8BMD2 |
| Got1 | P17174 | P00533 | Gpnmb | Q14956-1, Q14956 | P00533 |
| Grn | P28799 | P07237 | Gsn | P06396 | P32121 |
| H1-4 | P10412 | Q9Y468 | H1-5 | P16401 | P19320 |
| H4c1 | P62805 | P33992, P25205, P49736 | H4c11 | P62805 | P33992, P25205, P49736 |
| H4c12 | P62805 | P33992, P25205, P49736 | H4c14 | P62805 | P33992, P25205, P49736 |
| H4c2 | P62805 | P33992, P25205, P49736 | H4c3 | P62805 | P33992, P25205, P49736 |

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
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| H4c8 | P62805 | P33992, P25205, P49736 | H4c9 | P62805 | P33992, P25205, P49736 |
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| Hnrnpa2b1 | P22626 | P67809 | Hprt1 | P00492 | Q96G04 |
| Hsp90aa1 | P07900 | Q99558 | Hsp90ab1 | P08238 | O14757 |
| Hsp90b1 | P14625 | P11021 | Hspa4 | P34932 | P11142 |
| Hspa5 | P11021 | P13569 | Hspa8 | P11142 | Q99558 |
| Hspe1 | P61604 | P19320 | Hspg2 | P98160-PRO_0000391621, P98160-PRO_0000391622, P98160 | P35968 |
| Iqgap1 | B5DFH1 | Q5M824 | Itm2b | Q9Y287 | P04578 |
| Kpnb1 | Q14974 | Q99558 | Krt1 | P04264 | O15552 |
| Krt10 | P13645 | P19320 | Krt76 | Q01546 | P14373 |
| Krt79 | Q5XKE5 | A1L190 | Lasp1 | Q14847-2 | Q8TDS5 |
| Ldha | P00338 | P11142 | Ldhb | P07195 | P19320 |
| Lgals1 | P09382 | P35968 | Lgals3 | P16110 | Q9Z0P7 |
| Lgals3bp | Q08380 | Q9BZR8 | Lmna | P48678 | P31750 |
| Lox | P28300 | Q9UBX5, P15502 | Lrp1 | Q07954 | P02649 |
| Lum | P51884 | P50281 | Lxn | Q9BS40 | Q9UQK1 |
| Mdh1 | P40925 | P00533 | Mdh2 | P40926 | P19320 |
| Mif | P14174 | P14174 | Mmp2 | P08253 | P16035 |
| Msn | P26038 | P16070 | Mtpn | P62775 | Q5XI32 |
| Myh9 | P35579 | O00255 | Myl6 | P60660-2 | P46940 |
| Nampt | P43490 | P43490 | Ncl | P19338 | Q00987 |
| Nedd8 | Q15843 | P68104 | Nme1 | P15531 | P10911 |
| Npc2 | P61916 | 16113, O15118 | Npm1 | P06748 | Q8N726 |
| Nsfl1c | O35987 | Q01853 | Nucb1 | Q02818 | P10823 |
| P4hb | P07237 | Q6PJG9 | Pdcd5 | O14737 | Q9NRD5 |
| Pdia3 | P30101 | P30304 | Pdia6 | Q15084 | P11021 |
| Pea15 | Q15121 | P28482 | Pebp1 | P30086 | P16050 |
| Pfn1 | P07737 | O08816 | Pgam1 | P18669 | P12004 |
| Pgk1 | P00558, P00558-1 | O15379 | Pkm | P14618-1 | Q16665 |
| Plod1 | Q02809 | P55795 | Pls3 | Q9NRY6 | P49639 |
| Ppia | P62937 | O00267 | Ppib | P23284 | P40855 |
| Ppic | P45877 | Q8N9N5 | Prdx1 | Q06830 | P04156 |
| Prdx2 | P32119 | P10599 | Prdx6 | P30041 | Q7KZN9 |
| Prkcsh | P14314 | P04578 | Psma1 | P25786 | P21673 |
| Psma2 | P25787 | Q9Y5K5 | Psma3 | P25788 | Q12846 |
| Psma4 | P25789 | Q16665 | Psma5 | P28066 | Q9Y5K5 |
| Psma6 | P60900 | Q9Y5K5 | Psma7 | O14818 | Q16665 |
| Psmb1 | P20618 | Q9Y5K5 | Psmb2 | P49721 | Q9Y5K5 |
| Psmb3 | P49720 | Q9Y5K5 | Psmb4 | P28070 | Q9Y5K5 |
| Psmb5 | P28074 | Q9Y5K5 | Psmb8 | P28062-2 | Q13114 |
| Psme1 | Q06323 | Q9UL46 | Ptk7 | Q13308 | P35222 |
| Rac1 | P63000 | Q13177 | Rad23b | P54727 | P53350 |
| Rcn3 | Q96D15 | Q9UMX1 | Rnh1 | P13489 | P03950 |
| Rpl12 | P30050 | P27824 | Rpl14 | P50914 | Q99558 |

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
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| Rpl19 | P84098 | Q5S007 | Rpl24 | P83731 | Q99558 |
| Rpl27 | P61353 | Q99558 | Rpl30 | P14120 | Q12499 |
| Rpl4 | P36578 | Q99558 | Rpl6 | Q02878 | Q99558 |
| Rpl7a | P62424 | Q99558 | Rpl8 | P62917 | Q99558 |
| Rplp0 | P05388 | P03372 | Rps12 | P25398 | P03372 |
| Rps14 | P62263 | Q9Y3D8 | Rps2 | O74892 | O13648 |
| Rps8 | P62241 | Q15843 | Rpsa | P08865 | P03372 |
| Rrbp1 | Q9P2E9 | P27824 | S100a11 | P31949 | P04271 |
| S100a4 | P26447 | Q00987 | S100a6 | P06703 | Q00987 |
| Sema7a | O75326 | O60486 | Serpinc1 | P01008 | P01008 |
| Serpine1 | P05121 | Q8NBQ5 | Serpinf1 | P36955 | Q9P2X3 |
| Serping1 | E9PK97 | Q9BRI3 | Serpinh1 | P50454 | P03372 |
| Sfpq | P23246 | Q13882 | Sh3bgrl | O75368 | P00533 |
| Snrpd3 | P62318 | P14678 | Sod1 | P00441 | P29692 |
| Sod2 | P04179 | P04179 | Spp1 | P10451 | P16070 |
| Sri | P30626 | P30626 | Stip1 | P31948 | P07900 |
| Sytl4 | Q96C24 | Q86TI0 | Tf | P02787 | O00501 |
| Thbs1 | P07996-PRO_0000035842 | P16671 | Thbs2 | Q03350 | Q07954 |
| Timp1 | P01033 | P14780 | Timp2 | P16035 | P08253 |
| Tkt | Q16832 | P29353 | Tln1 | Q9Y490, P26039 | P05556 |
| Tmsb10 | P63313 | Q9NUX5 | Tmsb4x | P20065 | Q8WWQ8 |
| Tpi1 | P60174 | P12004 | Tpm4 | P67936 | Q9NRD5 |
| Tpt1 | P13693 | P29692 | Ttr | P02766 | Q15109 |
| Tubb4b | P68371 | Q5S007 | Tubb5 | P04350 | P22736 |
| Txn | P10599 | P19883 | Txndc5 | Q86UY0 | O43597 |
| Txnrd1 | Q16881 | Q03135 | Ube2n | P61088 | Q9UNE7 |
| Vapa | Q9WV55 | Q9QXM1 | Vat1 | P54219-3 | Q9Y5Y5 |
| Vcl | Q64727 | Q8VI36 | Vcp | P55072 | O96017 |
| Vim | P08670 | P11021 | Wdr1 | O75083 | P62993 |
| Ybx1 | P67809 | Q9NZI8, Q9Y6M1 | Ywhab | P35213 | Q9JLT6 |
| Ywhae | P62258 | P30304 | Ywhag | P61981 | P30304, O14757 |
| Ywhah | Q04917 | P30304 | Ywhaq | P27348 | P30304 |
| Ywhaz | P63104 | P30304 | | | |

| Input | ChEBI Id | Interacts with | Input | ChEBI Id | Interacts with |
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| Actb | P60709 | 18348 | Actg1 | P63261 | 18348 |
| Actn1 | P12814 | 18348 | Cfl1 | P23528 | 18348 |
| Dstn | P60981 | 16618 | Flna | P21333 | 18348 |
| Flnb | O75369 | 18348 | Iqgap1 | P46940 | 16618 |
| Kpnb1 | Q14974 | 18348 | Ldha | P00338 | 18348 |
| Lrp1 | Q07954 | 29108 | Msn | P26038 | 18348 |
| Myh9 | P35579 | 18348 | Myl6 | P60660 | 18348 |
| Npc2 | P61916 | 16113 | Pkm | P14618-1 | 18319 |
| Rac1 | P63000 | 15996 | Tln1 | Q9Y490 | 18348 |

# 7. Identifiers not found

These 19 identifiers were not found neither mapped to any entity in Reactome.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Aebp1 | Afm | Anxa3 | Cd5l | Chil3 | Cnn3 | Cpq | Dkk3 |
| Fkbp10 | Hars1 | Map4 | Mroh6 | Pdia4 | Postn | Prl7c1 | Ptms |
| Rexo2 | Tagln | Twf1 | | | | | |

reactome

# sWAT-MSC secretome from ND mice
# Pathway Analysis Report

## Table of Contents

# 1. Introduction

Reactome is a curated database of pathways and reactions in human biology. Reactions can be considered as pathway 'steps'. Reactome defines a 'reaction' as any event in biology that changes the state of a biological molecule. Binding, activation, translocation, degradation and classical biochemical events involving a catalyst are all reactions. Information in the database is authored by expert biologists, entered and maintained by Reactome's team of curators and editorial staff. Reactome content frequently cross-references other resources e.g. NCBI, Ensembl, UniProt, KEGG (Gene and Compound), ChEBI, PubMed and GO. Orthologous reactions inferred from annotation for Homo sapiens are available for 17 non-human species including mouse, rat, chicken, puffer fish, worm, fly, yeast, rice, and Arabidopsis. Pathways are represented by simple diagrams following an SBGN-like format.

Reactome's annotated data describe reactions possible if all annotated proteins and small molecules were present and active simultaneously in a cell. By overlaying an experimental dataset on these annotations, a user can perform a pathway over-representation analysis. By overlaying quantitative expression data or time series, a user can visualize the extent of change in affected pathways and its progression. A binomial test is used to calculate the probability shown for each result, and the p-values are corrected for the multiple testing (Benjamini–Hochberg procedure) that arises from evaluating the submitted list of identifiers against every pathway.

To learn more about our Pathway Analysis, please have a look at our relevant publications:

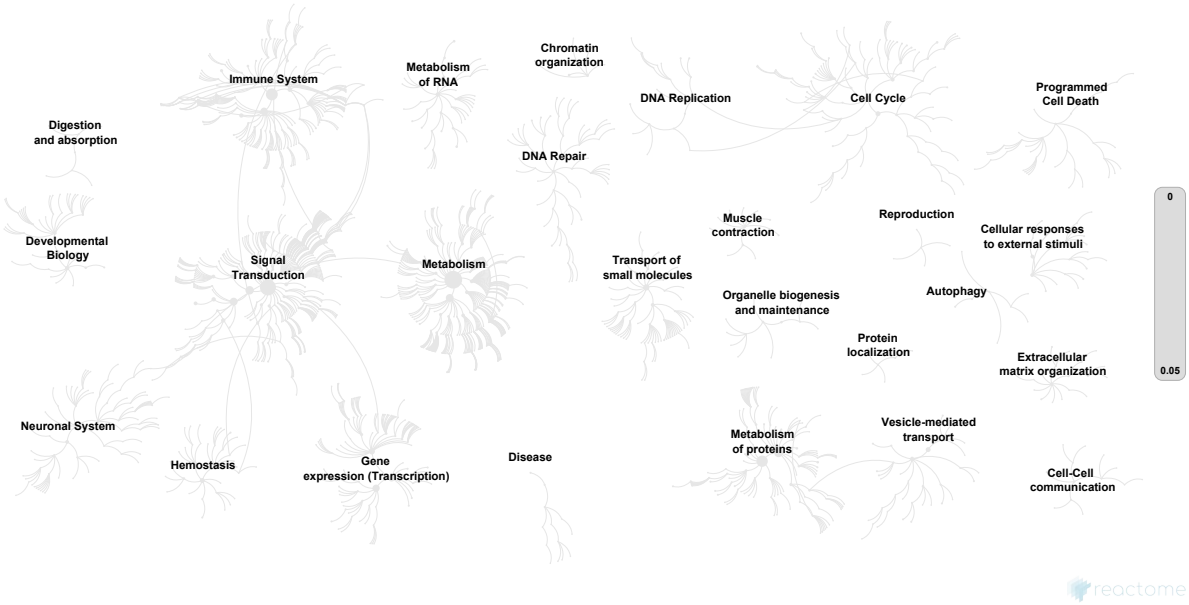
Fabregat A, Sidiropoulos K, Garapati P, Gillespie M, Hausmann K, Haw R, … D'Eustachio P (2016). The reactome pathway knowledgebase. Nucleic Acids Research, 44(D1), D481–D487. https://doi.org/10.1093/nar/gkv1351.

Fabregat A, Sidiropoulos K, Viteri G, Forner O, Marin-Garcia P, Arnau V, … Hermjakob H (2017). Reactome pathway analysis: a high-performance in-memory approach. BMC Bioinformatics, 18.

## 2. Properties

- This is an **overrepresentation** analysis: A statistical (hypergeometric distribution) test that determines whether certain Reactome pathways are over-represented (enriched) in the submitted data. It answers the question 'Does my list contain more proteins for pathway X than would be expected by chance?' This test produces a probability score, which is corrected for false discovery rate using the Benjamani-Hochberg method.
- 486 out of 532 identifiers in the sample were found in Reactome, where 10159 pathways were hit by at least one of them.
- IntAct interactors were included to increase the analysis background. This greatly increases the size of Reactome pathways, which maximises the chances of matching your submitted identifiers to the expanded pathway, but will include interactors that have not undergone manual curation by Reactome and may include interactors that have no biological significance, or unexplained relevance.
- This report is filtered to show only results for species 'Mus musculus' and resource 'all resources'.
- The unique ID for this analysis (token) is MjAyMDAzMjQxMjA5NDRfMzE4Mg%3D%3D. This ID is valid for at least 7 days in Reactome's server. Use it to access Reactome services with your data.

# 3. Genome-wide overview




This figure shows a genome-wide overview of the results of your pathway analysis. Reactome pathways are arranged in a hierarchy. The center of each of the circular "bursts" is the root of one top-level pathway, for example "DNA Repair". Each step away from the center represents the next level lower in the pathway hierarchy. The color code denotes over-representation of that pathway in your input dataset. Light grey signifies pathways which are not significantly over-represented.

# 4. Most significant pathways

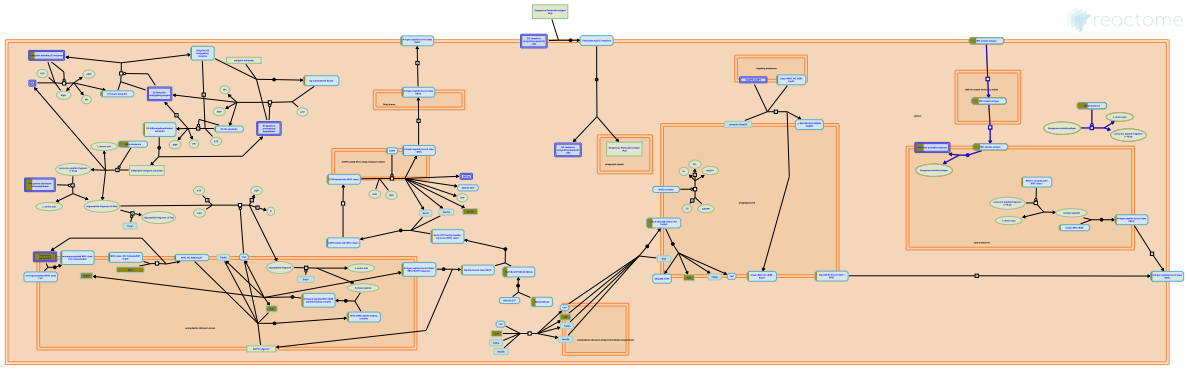
The following table shows the 25 most relevant pathways sorted by p-value.

| Pathway name | Entities | | | | Reactions | |
|---|---|---|---|---|---|---|
| | found | ratio | p-value | FDR* | found | ratio |
| Crosslinking of collagen fibrils | 12 / 25 | 0.002 | 0.054 | 1 | 13 / 13 | 0.002 |
| Association of TriC/CCT with target proteins during biosynthesis | 6 / 11 | 9.09e-04 | 0.093 | 1 | 1 / 1 | 1.28e-04 |
| Antagonism of Activin by Follistatin | 3 / 4 | 3.31e-04 | 0.104 | 1 | 2 / 2 | 2.56e-04 |
| Laminin interactions | 11 / 29 | 0.002 | 0.198 | 1 | 7 / 8 | 0.001 |
| HSF1 activation | 6 / 11 | 9.09e-04 | 0.199 | 1 | 5 / 6 | 7.69e-04 |
| Chk1/Chk2(Cds1) mediated inactivation of Cyclin B:Cdk1 complex | 6 / 14 | 0.001 | 0.204 | 1 | 1 / 4 | 5.13e-04 |
| NCAM1 interactions | 9 / 24 | 0.002 | 0.237 | 1 | 3 / 3 | 3.84e-04 |
| Regulation of ornithine decarboxylase (ODC) | 17 / 50 | 0.004 | 0.246 | 1 | 2 / 4 | 5.13e-04 |
| Regulation of Insulin-like Growth Factor (IGF) transport and uptake by Insulin-like Growth Factor Binding Proteins (IGFBPs) | 38 / 120 | 0.01 | 0.248 | 1 | 5 / 6 | 7.69e-04 |
| Post-translational protein phosphorylation | 36 / 114 | 0.009 | 0.26 | 1 | 1 / 1 | 1.28e-04 |
| Cross-presentation of soluble exogenous antigens (endosomes) | 17 / 51 | 0.004 | 0.271 | 1 | 4 / 4 | 5.13e-04 |
| Anchoring fibril formation | 6 / 16 | 0.001 | 0.295 | 1 | 2 / 4 | 5.13e-04 |
| Assembly of collagen fibrils and other multimeric structures | 22 / 69 | 0.006 | 0.303 | 1 | 20 / 26 | 0.003 |
| Activation of C3 and C5 | 3 / 7 | 5.79e-04 | 0.314 | 1 | 3 / 3 | 3.84e-04 |
| AUF1 (hnRNP D0) binds and destabilizes mRNA | 21 / 64 | 0.005 | 0.345 | 1 | 3 / 4 | 5.13e-04 |
| Elastic fibre formation | 14 / 44 | 0.004 | 0.355 | 1 | 13 / 16 | 0.002 |
| The role of GTSE1 in G2/M progression after G2 checkpoint | 24 / 79 | 0.007 | 0.376 | 1 | 5 / 10 | 0.001 |
| Regulation of RUNX2 expression and activity | 16 / 52 | 0.004 | 0.39 | 1 | 1 / 5 | 6.41e-04 |
| Ubiquitin-dependent degradation of Cyclin D | 16 / 53 | 0.004 | 0.418 | 1 | 1 / 3 | 3.84e-04 |
| p53-Independent DNA Damage Response | 16 / 53 | 0.004 | 0.418 | 1 | 1 / 3 | 3.84e-04 |
| p53-Independent G1/S DNA damage checkpoint | 16 / 53 | 0.004 | 0.418 | 1 | 1 / 3 | 3.84e-04 |
| Ubiquitin Mediated Degradation of Phosphorylated Cdc25A | 16 / 53 | 0.004 | 0.418 | 1 | 1 / 3 | 3.84e-04 |

| Pathway name | Entities | | | | Reactions | |
|---|---|---|---|---|---|---|
| | found | ratio | p-value | FDR* | found | ratio |
| RHO GTPases activate IQGAPs | 10 / 33 | 0.003 | 0.447 | 1 | 5 / 5 | 6.41e-04 |
| Autodegradation of the E3 ubiquitin ligase COP1 | 16 / 54 | 0.004 | 0.447 | 1 | 1 / 5 | 6.41e-04 |
| Transport of gamma-carboxylated protein precursors from the endoplasmic reticulum to the Golgi apparatus | 3 / 9 | 7.44e-04 | 0.463 | 1 | 3 / 9 | 0.001 |

* False Discovery Rate

## 11. Cross-presentation of soluble exogenous antigens (endosomes) (R-MMU-1236978)



**Inferred from:** Cross-presentation of soluble exogenous antigens (endosomes).

This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

More details and caveats of the event inference in Reactome. For details on PANTHER see also: http://www.pantherdb.org/about.jsp

### References

### Edit history

| Date | Action | Author |
|---|---|---|
| 2020-03-08 | Created | Cook J |

### Entities found in this pathway (17)

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| Mrc2 | Q64449 | Psma1 | Q9R1P4 | Psma2 | P49722 |
| Psma3 | O70435 | Psma4 | Q9R1P0 | Psma5 | Q9Z2U1 |
| Psma6 | Q9QUM9 | Psma7 | Q9Z2U0 | Psmb1 | O09061 |
| Psmb2 | Q9R1P3 | Psmb3 | Q9R1P1 | Psmb4 | P99026 |
| Psmb5 | O55234 | Psmb6 | Q60692 | Psmb7 | P70195 |
| Psmc2 | P46471 | Psmd2 | Q8VDM4 | | |

# 6. Identifiers found

Below is a list of the input identifiers that have been found or mapped to an equivalent element in Reactome, classified by resource.

## Entities (486)

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
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| A2m | P01023 | Acta2 | P62738 | Actb | P60709 |
| Actg1 | P63261 | Actn1 | P12814 | Actn4 | O43707 |
| Actr2 | P61160 | Actr3 | F1P679 | Adam15 | Q13444 |
| Adam9 | Q13443 | Adamts1 | Q9UHI8 | Adamts5 | Q9UNA0 |
| Adss2 | P30520 | Ahcy | P23526 | Ahsg | P02765 |
| Aimp1 | Q12904 | Ak2 | P54819 | Akr1a1 | P14550 |
| Akr1b1 | P15121 | Alb | P02768 | Aldoa | P04075 |
| Ang | P21570 | Angptl4 | Q9Z1P8 | Anxa1 | P04083 |
| Anxa2 | P07355 | Anxa5 | P08758 | Anxa6 | P08133 |
| Ap2a1 | O95782 | Aplp2 | Q06481 | Apoh | P02749 |
| Arcn1 | Q5XJY5 | Arhgdia | Q99PT1 | Arhgdib | P52566 |
| Arpc1b | E2RMT4 | Arpc3 | E2R985 | Arpc4 | E2QWU0 |
| Asah1 | Q13510 | Asl | P04424 | Atic | P31939 |
| Atox1 | Q9TT99 | Atp1a1 | P05023 | Atp5f1b | J9NT37 |
| Atp6ap2 | O75787 | Atp6v1a | P38606 | Atp6v1b2 | L7N2R0 |
| Axl | P30530 | B2m | P61769 | B4galt1 | P15291 |
| Bag3 | Q5U2U8 | Bgn | P21810 | Blvrb | P30043 |
| Bmp1 | P13497 | C1ra | Q8CG16 | C3 | P01024 |
| C4b | P01029 | Cald1 | Q62736 | Calr | P27797 |
| Calu | O43852 | Cand1 | Q86VP6 | Cant1 | Q8WVQ1 |
| Canx | P35564 | Cap1 | Q01518 | Capg | Q9BPX3 |
| Capn2 | P17655 | Capza2 | P47755 | Cbr3 | F1N8Y3 |
| Cck | K9J7V7 | Ccl2 | P13500 | Ccl7 | Q03366 |
| Ccl8 | Q09141 | Ccn1 | O00622 | Ccn2 | P29279 |
| Cct2 | P78371 | Cct3 | P49368 | Cct5 | P48643 |
| Cct7 | Q99832 | Cct8 | P50990 | Cd81 | P35762 |
| Cdc37 | Q16543 | Cdc42 | P60953 | Cdh11 | P55288 |
| Cdh2 | P19022 | Cfl1 | P23528 | Ckb | P12277 |
| Cltc | Q00610 | Cmpk1 | P30085 | Cndp2 | Q96KP4 |
| Cnn2 | Q99439 | Col12a1 | Q99715 | Col1a1 | P02452 |
| Col1a2 | P08123 | Col3a1 | P02461 | Col4a1 | P02462 |
| Col4a2 | P08572 | Col5a1 | P20908 | Col5a2 | P05997 |
| Col6a1 | P12109 | Col6a2 | P12110 | Col6a3 | P12111 |
| Colec12 | Q5KU26 | Comp | P49747 | Copa | Q8CIE6 |
| Copg1 | Q9QZE5 | Cotl1 | Q14019 | Cpe | P16870 |
| Creg1 | O75629 | Crk | A0A287A2R9 | Crlf1 | F1ML91 |
| Csf1 | P09603 | Csrp1 | P21291 | Cst3 | P01034 |
| Cst6 | P04080 | Cstb | P04080 | Ctsa | P10619 |
| Ctsb | P07858 | Ctsh | P09668 | Ctsl | P07711 |
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| Cycs | P99999 | Dag1 | Q14118 | Dbi | P07108 |

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| Dpysl2 | P47942 | Ecm1 | Q16610 | Eef1a1 | P62630 |
| Eef1b | P24534 | Eef1g | P26641 | Eef2 | P13639 |
| Efemp1 | Q12805 | Efemp2 | O95967 | Efhd2 | F1SUW2 |
| Ehd1 | Q641Z6 | Ehd2 | Q4V8H8 | Eif2s1 | P05198 |
| Eif2s3x | Q9Z0N1 | Eif3c | Q99613 | Eif3i | Q13347 |
| Eif4h | Q15056 | Eif5a | P63241 | Eloc | Q15369 |
| Emilin1 | Q9Y6C2 | Emilin2 | Q9BXX0 | Eno1 | P06733 |
| Eno3 | P13929 | Ero1a | E2RNW5 | Erp44 | Q9BS26 |
| Ext1 | Q16394 | Ext2 | Q93063 | F2 | J9NSF9 |
| F3 | P13726 | F5 | P12259 | Fabp5 | Q01469 |
| Fah | P16930 | Fam3c | Q92520 | Fasn | E7F5V3 |
| Fbln1 | P23142 | Fbln2 | P98095 | Fbln5 | Q9UBX5 |
| Fbn1 | P35555 | Fermt2 | A0A0G2JWC7 | Fh | Q148D3 |
| Fkbp1a | P62942 | Flna | P21333 | Flnb | A0A0G2JXT8 |
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| Tubb5 | P04350 | P22736 | Tubb6 | Q922F4 | Q62108 |
| Txndc5 | Q86UY0 | O43597 | Txnrd1 | Q16881 | Q03135 |
| Uba1 | P22314 | Q9UNE7 | Ube2d3 | P61077 | P98170 |
| Ube2i | Q7KZS0 | P60709 | Ube2n | P61088 | P98170 |
| Ugp2 | Q16851 | O76003 | Usp5 | P45974-2 | Q9NWF9 |
| Vapa | Q9P0L0 | P27824 | Vasn | Q6EMK4 | P22735 |
| Vat1 | P54219-3 | P29033 | Vcam1 | P19320 | P40429 |
| Vcl | Q64727 | Q8VI36 | Vcp | P55072 | O96017 |

| Input | UniProt Id | Interacts with |
|---|---|---|
| Vegfa | EBI-2895491 | Q16665 |
| Vim | P08670 | P11021 |
| Wdr1 | O75083 | P62993 |
| Yars | P54577 | P09874 |
| Ywhab | P35213 | Q9JLT6 |
| Ywhag | P61981 | P11940 |
| Ywhaq | P27348 | P30304 |

| Input | UniProt Id | Interacts with |
|---|---|---|
| Vegfd | O43915 | Q15836 |
| Vps35 | Q9EQH3 | P63101 |
| Xpnpep1 | Q9NQW7-3 | P69892 |
| Ybx1 | P67809 | Q99697 |
| Ywhae | P62258 | P30304 |
| Ywhah | Q04917 | P30304 |
| Ywhaz | P63101 | P63017 |

| Input | ChEBI Id | Interacts with |
|---|---|---|
| Actb | P60709 | 16851 |
| Actn1 | P12814 | 16851 |
| Angptl4 | Q9BY76 | 28815 |
| Cand1 | Q86VP6 | 16851 |
| Cfl1 | P23528 | 16851 |
| Dstn | P60981 | 16618 |
| Flna | P21333 | 16851 |
| Flnc | Q14315 | 16851 |
| Itgb1 | P05556 | 16618 |
| Kpnb1 | Q14974 | 16851 |
| Lrp1 | Q07954 | 29108 |
| Myh9 | P35579 | 16851 |
| Pkm | P14618-1 | 18319 |
| Rac1 | P63000 | 15996 |
| Ran | P62826 | 17552, 15996 |
| Sptbn1 | Q01082 | 16618 |

| Input | ChEBI Id | Interacts with |
|---|---|---|
| Actg1 | P63261 | 16851 |
| Actn4 | O43707 | 16851 |
| Atp1a1 | P05023 | 16618 |
| Cdc42 | P60953 | 15996 |
| Cltc | Q00610 | 16618 |
| Ehd1 | Q9H4M9 | 16618 |
| Flnb | O75369 | 16851 |
| Iqgap1 | P46940 | 16618 |
| Kif5b | P33176 | 16851 |
| Ldha | P00338 | 16851 |
| Msn | P26038 | 16851 |
| Niban2 | Q96TA1 | 17283 |
| Rab7a | P51149 | 16851 |
| Rack1 | P63244 | 16851 |
| Rdx | P35241 | 16851 |
| Tln1 | Q9Y490 | 18348 |

# 7. Identifiers not found

These 46 identifiers were not found neither mapped to any entity in Reactome.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Aars1 | Abracl | Aebp1 | Angptl2 | Anxa3 | Ccdc80 | Cd248 | Clic1 |
| Clic4 | Cpxm1 | Crip1 | Crip2 | Dkk3 | Dpp3 | Eprs1 | Fkbp10 |
| GaskbB | Glipr2 | Gm20431 | Hars1 | Heg1 | Hint1 | Krt90 | Ly6a |
| Map4 | Metrnl | Oaf | Olfml3 | Pcdhgc3 | Pdia4 | Postn | Prl2c3 |
| Prl7c1 | Ptms | Rars1 | Rexo2 | Rnase4 | Scpep1 | Serpina3n | Srpx2 |
| Svep1 | Tagln | Tgfbr3 | Twf1 | Uap1l1 | Ufm1 | | |

reactome

# BM-MSC secretome from ND mice
# Pathway Analysis Report

## Table of Contents

# 1. Introduction

Reactome is a curated database of pathways and reactions in human biology. Reactions can be considered as pathway 'steps'. Reactome defines a 'reaction' as any event in biology that changes the state of a biological molecule. Binding, activation, translocation, degradation and classical biochemical events involving a catalyst are all reactions. Information in the database is authored by expert biologists, entered and maintained by Reactome's team of curators and editorial staff. Reactome content frequently cross-references other resources e.g. NCBI, Ensembl, UniProt, KEGG (Gene and Compound), ChEBI, PubMed and GO. Orthologous reactions inferred from annotation for Homo sapiens are available for 17 non-human species including mouse, rat, chicken, puffer fish, worm, fly, yeast, rice, and Arabidopsis. Pathways are represented by simple diagrams following an SBGN-like format.

Reactome's annotated data describe reactions possible if all annotated proteins and small molecules were present and active simultaneously in a cell. By overlaying an experimental dataset on these annotations, a user can perform a pathway over-representation analysis. By overlaying quantitative expression data or time series, a user can visualize the extent of change in affected pathways and its progression. A binomial test is used to calculate the probability shown for each result, and the p-values are corrected for the multiple testing (Benjamini–Hochberg procedure) that arises from evaluating the submitted list of identifiers against every pathway.

To learn more about our Pathway Analysis, please have a look at our relevant publications:

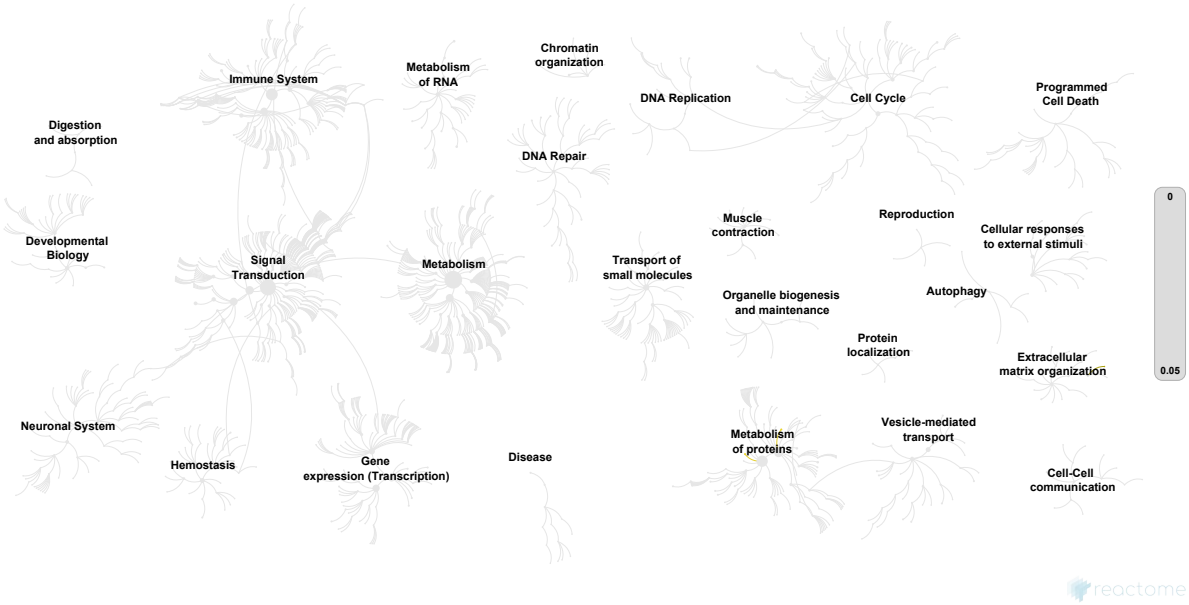
Fabregat A, Sidiropoulos K, Garapati P, Gillespie M, Hausmann K, Haw R, … D'Eustachio P (2016). The reactome pathway knowledgebase. Nucleic Acids Research, 44(D1), D481–D487. https://doi.org/10.1093/nar/gkv1351.

Fabregat A, Sidiropoulos K, Viteri G, Forner O, Marin-Garcia P, Arnau V, … Hermjakob H (2017). Reactome pathway analysis: a high-performance in-memory approach. BMC Bioinformatics, 18.

## 2. Properties

- This is an **overrepresentation** analysis: A statistical (hypergeometric distribution) test that determines whether certain Reactome pathways are over-represented (enriched) in the submitted data. It answers the question 'Does my list contain more proteins for pathway X than would be expected by chance?' This test produces a probability score, which is corrected for false discovery rate using the Benjamani-Hochberg method.
- 418 out of 456 identifiers in the sample were found in Reactome, where 8662 pathways were hit by at least one of them.
- IntAct interactors were included to increase the analysis background. This greatly increases the size of Reactome pathways, which maximises the chances of matching your submitted identifiers to the expanded pathway, but will include interactors that have not undergone manual curation by Reactome and may include interactors that have no biological significance, or unexplained relevance.
- This report is filtered to show only results for species 'Mus musculus' and resource 'all resources'.
- The unique ID for this analysis (token) is MjAyMDAzMjQxMjEzMThfMzE4NA%3D%3D. This ID is valid for at least 7 days in Reactome's server. Use it to access Reactome services with your data.

# 3. Genome-wide overview




This figure shows a genome-wide overview of the results of your pathway analysis. Reactome pathways are arranged in a hierarchy. The center of each of the circular "bursts" is the root of one top-level pathway, for example "DNA Repair". Each step away from the center represents the next level lower in the pathway hierarchy. The color code denotes over-representation of that pathway in your input dataset. Light grey signifies pathways which are not significantly over-represented.

# 4. Most significant pathways

The following table shows the 25 most relevant pathways sorted by p-value.

| Pathway name | Entities | | | | Reactions | |
|---|---|---|---|---|---|---|
| | found | ratio | p-value | FDR* | found | ratio |
| Regulation of Insulin-like Growth Factor (IGF) transport and uptake by Insulin-like Growth Factor Binding Proteins (IGFBPs) | 42 / 120 | 0.01 | 0.009 | 1 | 5 / 6 | 7.69e-04 |
| Post-translational protein phosphorylation | 40 / 114 | 0.009 | 0.01 | 1 | 1 / 1 | 1.28e-04 |
| Crosslinking of collagen fibrils | 11 / 25 | 0.002 | 0.037 | 1 | 13 / 13 | 0.002 |
| Antagonism of Activin by Follistatin | 3 / 4 | 3.31e-04 | 0.07 | 1 | 2 / 2 | 2.56e-04 |
| Laminin interactions | 11 / 29 | 0.002 | 0.085 | 1 | 7 / 8 | 0.001 |
| Assembly of collagen fibrils and other multimeric structures | 22 / 69 | 0.006 | 0.098 | 1 | 23 / 26 | 0.003 |
| Chk1/Chk2(Cds1) mediated inactivation of Cyclin B:Cdk1 complex | 6 / 14 | 0.001 | 0.116 | 1 | 1 / 4 | 5.13e-04 |
| NCAM1 interactions | 9 / 24 | 0.002 | 0.118 | 1 | 1 / 3 | 3.84e-04 |
| Association of TriC/CCT with target proteins during biosynthesis | 5 / 11 | 9.09e-04 | 0.12 | 1 | 1 / 1 | 1.28e-04 |
| HSF1 activation | 5 / 11 | 9.09e-04 | 0.12 | 1 | 5 / 6 | 7.69e-04 |
| Elastic fibre formation | 14 / 44 | 0.004 | 0.161 | 1 | 13 / 16 | 0.002 |
| ECM proteoglycans | 18 / 57 | 0.005 | 0.193 | 1 | 12 / 15 | 0.002 |
| Dissolution of Fibrin Clot | 6 / 17 | 0.001 | 0.214 | 1 | 17 / 18 | 0.002 |
| Activation of C3 and C5 | 3 / 7 | 5.79e-04 | 0.228 | 1 | 3 / 3 | 3.84e-04 |
| Non-integrin membrane-ECM interactions | 13 / 42 | 0.003 | 0.288 | 1 | 5 / 9 | 0.001 |
| Cross-presentation of soluble exogenous antigens (endosomes) | 14 / 51 | 0.004 | 0.316 | 1 | 4 / 4 | 5.13e-04 |
| Anchoring fibril formation | 5 / 16 | 0.001 | 0.324 | 1 | 2 / 4 | 5.13e-04 |
| Molecules associated with elastic fibres | 10 / 36 | 0.003 | 0.341 | 1 | 7 / 9 | 0.001 |
| Transport of gamma-carboxylated protein precursors from the endoplasmic reticulum to the Golgi apparatus | 3 / 9 | 7.44e-04 | 0.354 | 1 | 3 / 9 | 0.001 |
| Collagen formation | 27 / 106 | 0.009 | 0.363 | 1 | 52 / 76 | 0.01 |
| Platelet degranulation | 33 / 131 | 0.011 | 0.367 | 1 | 5 / 8 | 0.001 |
| TP53 Regulates Transcription of Death Receptors and Ligands | 1 / 2 | 1.65e-04 | 0.375 | 1 | 1 / 1 | 1.28e-04 |
| Collagen degradation | 16 / 62 | 0.005 | 0.387 | 1 | 15 / 20 | 0.003 |

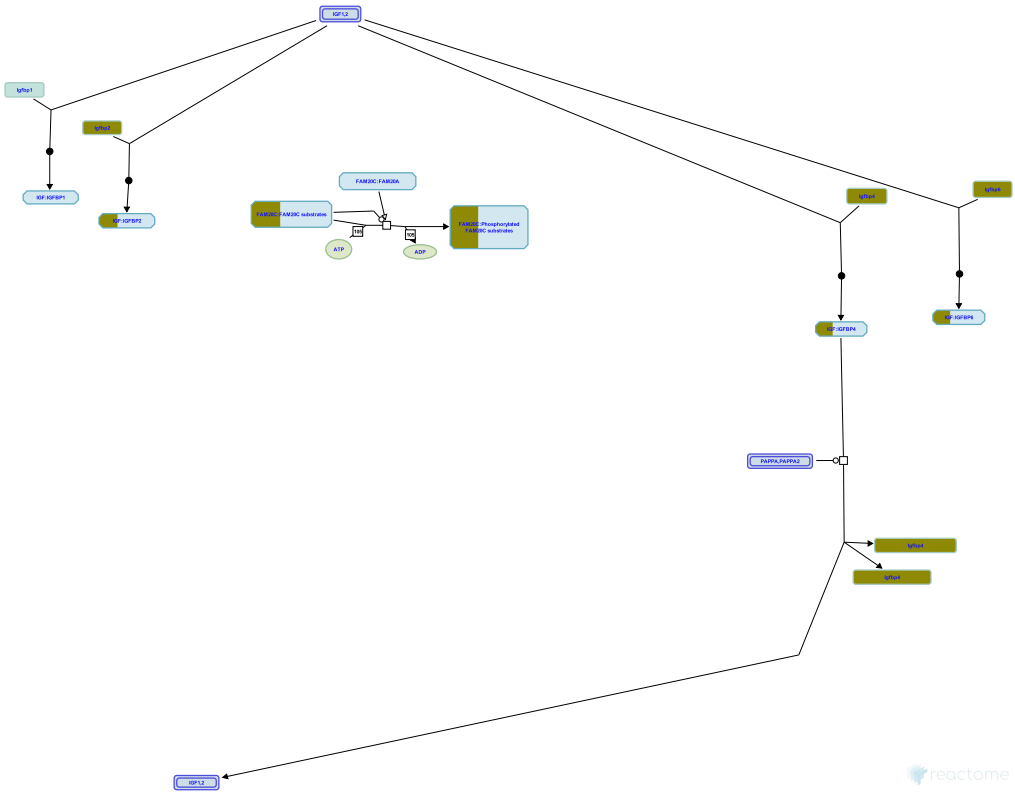
| Pathway name | Entities | | | | Reactions | |
|---|---|---|---|---|---|---|
| | found | ratio | p-value | FDR* | found | ratio |
| Regulation of ornithine decarboxylase (ODC) | 13 / 50 | 0.004 | 0.395 | 1 | 1 / 4 | 5.13e-04 |
| Keratan sulfate degradation | 6 / 22 | 0.002 | 0.414 | 1 | 3 / 6 | 7.69e-04 |

* False Discovery Rate

# 5. Pathways details

For every pathway of the most significant pathways, we present its diagram, as well as a short summary, its bibliography and the list of inputs found in it.

## 1. Regulation of Insulin-like Growth Factor (IGF) transport and uptake by Insulin-like Growth Factor Binding Proteins (IGFBPs) (R-MMU-381426)



**Cellular compartments:** extracellular region.

**Inferred from:** Regulation of Insulin-like Growth Factor (IGF) transport and uptake by Insulin-like Growth Factor Binding Proteins (IGFBPs).

This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

More details and caveats of the event inference in Reactome. For details on PANTHER see also: http://www.pantherdb.org/about.jsp

### References

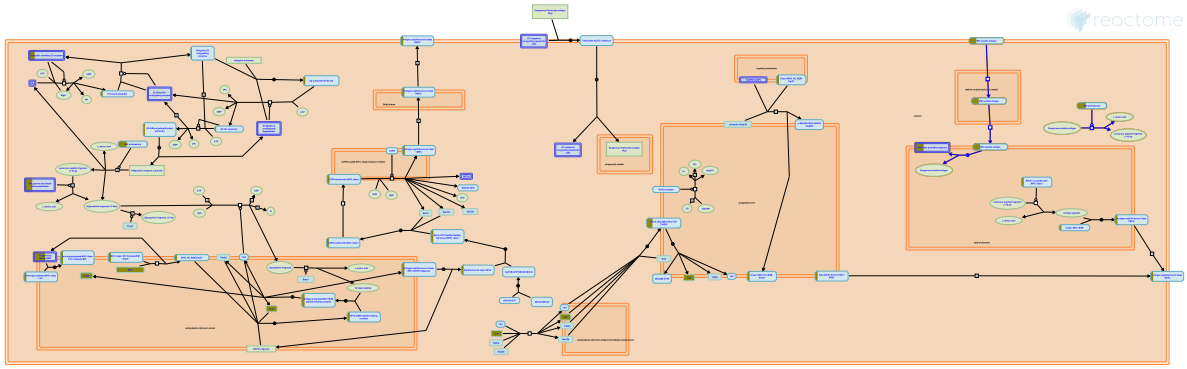
### Edit history

| Date | Action | Author |
|---|---|---|
| 2020-03-08 | Created | Cook J |

## Entities found in this pathway (42)

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| Ahsg | P29699 | Alb | P07724 | Apoe | P08226 |
| C3 | P01027 | C4b | P01029 | Calu | O35887 |
| Ccn1 | P18406 | Cdh2 | P15116 | Cp | Q61147 |
| Csf1 | P07141 | Cst3 | P21460 | F5 | O88783 |
| Fbn1 | Q61554 | Fn1 | P11276 | Fstl1 | Q62356 |
| Gas6 | Q61592 | Hsp90b1 | P08113 | Igfbp2 | P47877 |
| Igfbp3 | P47878 | Igfbp4 | P47879 | Igfbp6 | P47880 |
| Igfbp7 | Q61581 | Itih2 | Q61703 | Lamb1 | P02469 |
| Lamb2 | Q61292 | Lamc1 | P02468 | Lgals1 | P16045 |
| Mfge8 | P21956 | Nucb1 | Q02819 | P4hb | P09103 |
| Pcsk9 | Q80W65 | Pdia6 | Q922R8 | Prkcsh | O08795 |
| Prss23 | Q9D6X6 | Qsox1 | Q8BND5 | Rcn1 | Q05186 |
| Serpinc1 | P32261 | Sparcl1 | P70663 | Spp1 | P10923 |
| Tf | Q921I1 | Timp1 | P12032 | Vcan | Q62059 |

## 16. Cross-presentation of soluble exogenous antigens (endosomes) (R-MMU-1236978)



**Inferred from:** Cross-presentation of soluble exogenous antigens (endosomes).

This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

More details and caveats of the event inference in Reactome. For details on PANTHER see also: http://www.pantherdb.org/about.jsp

### References

### Edit history

| Date | Action | Author |
|---|---|---|
| 2020-03-08 | Created | Cook J |

### Entities found in this pathway (14)

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| Mrc2 | Q64449 | Psma1 | Q9R1P4 | Psma2 | P49722 |
| Psma4 | Q9R1P0 | Psma5 | Q9Z2U1 | Psma6 | Q9QUM9 |
| Psma7 | Q9Z2U0 | Psmb2 | Q9R1P3 | Psmb3 | Q9R1P1 |
| Psmb4 | P99026 | Psmb5 | O55234 | Psmb6 | Q60692 |
| Psmb8 | P28063 | Psme1 | P97371 | | |

# 6. Identifiers found

Below is a list of the input identifiers that have been found or mapped to an equivalent element in Reactome, classified by resource.

### Entities (418)

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| A2m | P01023 | Acta2 | P62739 | Actb | P60709 |
| Actg1 | Z4YHI2 | Actr2 | P61160 | Actr3 | F1P679 |
| Adam15 | Q13444 | Adam9 | Q13443 | Adamts1 | Q9UHI8 |
| Adamts5 | Q9UNA0 | Adm | F7AC43 | Ahsg | P02765 |
| Ak1 | P00568 | Ak2 | P54819 | Akr1a1 | P14550 |
| Akr1b1 | P15121 | Alb | P02768 | Aldh1a2 | O94788 |
| Aldh1a3 | P47895 | Aldoa | P04075 | Anxa2 | Q07936 |
| Anxa5 | P08758 | Apoe | P02649 | Apoh | P02749 |
| Arcn1 | Q5XJY5 | Arg1 | P05089 | Arhgdia | F1PL93 |
| Arhgdib | P52566 | Arpc1b | E2RMT4 | Arpc3 | E2R985 |
| Asah1 | Q13510 | Atic | P31335 | Atox1 | Q9TT99 |
| Atp6ap2 | O75787 | Axl | P30530 | B2m | P61769 |
| B4galt1 | P15291 | Bag3 | Q5U2U8 | Bgn | P21810 |
| Blvrb | P30043 | Bmp1 | P13497 | C1qa | E1BSP0 |
| C1qc | Q02105 | C1ra | Q8CG16 | C3 | P01024 |
| C4b | P01029 | Calr | P27797 | Calu | O43852 |
| Cant1 | Q8WVQ1 | Cap1 | Q01518 | Capg | Q9BPX3 |
| Cck | K9J7V7 | Ccl2 | P13500 | Ccl7 | Q03366 |
| Ccl8 | Q09141 | Ccl9 | Q5FVN3 | Ccn1 | O00622 |
| Ccn2 | P29279 | Cct2 | P78371 | Cct4 | P50991 |
| Cct5 | P48643 | Cct7 | Q99832 | Cd14 | P08571 |
| Cdh11 | P55288 | Cdh2 | P19022 | Cemip | Q8WUJ3 |
| Cfl1 | P23528 | Ckb | P12277 | Cltc | Q00610 |
| Clu | P10909 | Cmpk1 | P30085 | Cndp2 | Q96KP4 |
| Cnn2 | Q99439 | Col1a1 | P02452 | Col1a2 | P08123 |
| Col2a1 | P02458 | Col3a1 | P02461 | Col4a1 | P02462 |
| Col4a2 | P08572 | Col5a1 | P20908 | Col5a2 | P05997 |
| Col6a1 | P12109 | Col6a2 | P12110 | Col6a3 | P12111 |
| Colec12 | Q5KU26 | Cotl1 | Q14019 | Cp | P00450 |
| Cpe | P16870 | Creg1 | O75629 | Crlf1 | R4GH98 |
| Csf1 | P09603 | Csrp1 | P21291 | Cst3 | P01034 |
| Cstb | P04080 | Ctsa | P10619 | Ctsb | P07858 |
| Ctsh | P09668 | Ctsl | P07711 | Ctss | P25774 |
| Ctsz | Q9UBR2 | Cxcl12 | Q5EBF6 | Cxcl5 | P50228 |
| Dag1 | Q14118 | Dbi | P07108 | Dcn | P07585 |
| Ddx39b | Q13838 | Des | P17661 | Dld | P09622 |
| Dpysl2 | P47942 | Ecm1 | Q16610 | Eef1a1 | P62630 |
| Eef1b | P24534 | Eef1g | P26641 | Eef2 | P13639 |
| Efemp1 | Q12805 | Efemp2 | O95967 | Eif4a1 | P60842 |
| Eif5a | P63241 | Emilin1 | Q9Y6C2 | Emilin2 | Q9BXX0 |
| Eno1 | P06733 | Erp44 | Q9BS26 | Ext1 | Q16394 |

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| Ext2 | Q93063 | Ezr | P15311 | F2 | P00734 |
| F3 | P13726 | F5 | P12259 | Fabp5 | Q01469 |
| Fbln1 | P23142 | Fbln2 | P98095 | Fbln5 | Q9UBX5 |
| Fbn1 | P35555 | Fermt2 | F1PFB4 | Fkbp1a | P62942 |
| Flna | P21333 | Flnb | A0A0G2JXT8 | Flnc | E2RP26 |
| Fmod | Q06828 | Fn1 | P02751 | Fscn1 | Q16658 |
| Fst | P47931 | Fstl1 | Q12841 | Ftl1 | P02793 |
| Gaa | P10253 | Ganab | Q14697 | Gapdh | P04406 |
| Gas6 | Q14393 | Gdi2 | P50395 | Glo1 | Q04760 |
| Gm20390 | E9PZF0 | Gm20547 | B8JJN0 | Gm2a | P17900 |
| Gmfb | F6WBZ2 | Got2 | P00505 | Gpc1 | P35052 |
| Gpc4 | O75487 | Gpi | P06744 | Grn | P28799 |
| Gsn | P06396 | Gstm1 | A4IFG0, Q9N0V4 | Gstm2 | F6Q751 |
| Gsto1 | P78417 | Gstp1 | P09211 | H2-D1 | P14427 |
| H2-Q4 | Q8HWB2 | H4c1 | P62805 | H4c11 | P62805 |
| H4c12 | P62805 | H4c14 | P62805 | H4c2 | P62805 |
| H4c3 | P62805 | H4c4 | P62805 | H4c6 | P62805 |
| H4c8 | P62805 | H4c9 | P62805 | H4f16 | P62804 |
| Hba | P01966 | Hdgf | P51858 | Hexa | P06865 |
| Hexb | P07686 | Hist1h4m | P62804 | Hk1 | P19367 |
| Hmox1 | P09601 | Hnrnpa1 | F6XNZ3 | Hnrnpa2b1 | P22626 |
| Hnrnpa3 | F6YRE5 | Hnrnpk | P61979 | Hp | P00738 |
| Hprt1 | P00492 | Hsp90aa1 | P82995 | Hsp90ab1 | P34058 |
| Hsp90b1 | P14625 | Hspa4 | O88600 | Hspa5 | P11021 |
| Hspa8 | P11142 | Hspd1 | A4II42 | Hspg2 | P98160 |
| Htra1 | Q92743 | Hyou1 | Q9Y4L1 | Idh1 | O75874 |
| Ifi30 | B3SP85 | Igfbp2 | P47877 | Igfbp3 | P17936 |
| Igfbp4 | P22692 | Igfbp6 | P47880 | Igfbp7 | Q16270 |
| Inhba | Q04998 | Inhbb | Q04999 | Iqgap1 | P46940 |
| Islr | O14498 | Isyna1 | Q9JHU9 | Itgb1 | P05556 |
| Itih2 | P19823 | Itih3 | Q06033 | Itm2b | Q9Y287 |
| Kpnb1 | Q14974 | Krt1 | P04264 | Krt2 | P35908 |
| Krt5 | F1SGG6 | Krt76 | Q01546 | Krt77 | Q7Z794 |
| Krt78 | Q8N1N4 | Krt79 | Q5XKE5 | Lama2 | P24043 |
| Lama4 | Q16363 | Lamb1 | P07942 | Lamb2 | P11047, P55268 |
| Lamc1 | P11047 | Lcn2 | P80188 | Lcp1 | P13796 |
| Ldha | P00340 | Ldhb | P00337 | Lgals1 | P09382 |
| Lgals3 | P17931 | Lgals3bp | Q08380 | Lgmn | Q9R0J8 |
| Lmna | P48678-3 | Lox | P28300 | Loxl1 | Q08397 |
| Loxl2 | Q9Y4K0 | Loxl3 | P58215 | Lpl | P11151 |
| Lrp1 | E1BGJ0 | Ltbp2 | Q14767 | Lum | P51884 |
| Lyz2 | P08905 | Man2a1 | Q16706 | Man2b1 | O00754 |
| Manf | P55145 | Marcks | A0A287BRL8 | Mdh1 | P40925 |
| Mdh2 | P40926 | Me1 | P48163 | Mfap5 | Q13361 |
| Mfge8 | Q08431 | Mif | P14174 | Minpp1 | Q9UNW1 |
| Mmp12 | P39900 | Mmp19 | Q99542 | Mmp2 | P08253 |
| Mmp3 | P08254 | Mrc2 | Q9UBG0 | Msn | P26038 |
| Mt2 | P02798 | Myh9 | F1MQ37 | Myl12a | Q6ZWQ9 |
| Myl6 | P60661 | Naglu | P54802 | Ncl | P09405 |

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|---|---|---|---|---|---|
| Zyx | Q9N675 | | | | |

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|---|---|---|---|---|---|
| Acta2 | ENSG00000107796 | Actb | ENST00000331789 | Anxa2 | ENSG00000182718 |
| Apoe | ENSG00000130203 | B2m | ENSG00000166710 | C1qc | ENSGALP00000007599 |
| Calr | ENSG00000179218 | Ccl2 | ENSG00000108691 | Ccn1 | ENSG00000145386 |
| Ccn2 | ENSG00000118523 | Cfl1 | ENSG00000172757 | Cnn2 | ENSG00000064666 |
| Col1a1 | ENSG00000108821 | Col1a2 | ENSG00000164692 | Csf1 | ENSG00000184371 |
| Csrp1 | ENSG00000159176 | Cxcl12 | ENSG00000107562 | F3 | ENSG00000117525 |
| Fn1 | ENSG00000115414 | Fscn1 | ENSG00000075618 | Gsto1 | ENSG00000148834 |
| Hdgf | ENSG00000143321 | Hmox1 | ENSG00000100292 | Hnrnpa2b1 | ENSG00000122566 |
| Hsp90aa1 | ENSG00000080824 | Hsp90b1 | ENSG00000166598 | Hspa5 | ENSG00000044574 |
| Hspa8 | ENSG00000109971 | Hspd1 | ENSG00000144381 | Hyou1 | ENSG00000149428 |
| Ifi30 | ENSG00000216490 | Igfbp3 | ENSG00000146674 | Igfbp7 | ENSG00000163453 |
| Itgb1 | ENSG00000150093 | Lcn2 | ENSG00000148346 | Lcp1 | ENSG00000136167 |
| Lgals3 | ENSG00000131981 | Lmna | ENSG00000160789 | Lpl | ENSG00000175445 |
| Me1 | ENSG00000065833 | Mif | ENSG00000240972 | Mmp2 | ENSG00000087245 |
| Mmp3 | ENSG00000149968 | Msn | ENSG00000147065 | Mt2 | ENSG00000125148 |
| Pdia6 | ENSG00000143870 | Pf4 | ENSG00000163737 | Ppia | ENSG00000196262 |
| Psmb8 | ENSG00000204264 | Rbbp4 | ENSG00000162521 | Rplp0 | ENSG00000089157 |
| Serpinb2 | ENSG00000197632 | Serpine1 | ENSG00000106366 | Serpinh1 | ENSG00000149257 |
| Sod2 | ENSG00000112096 | Spp1 | ENSG00000118785 | Stmn1 | ENSG00000117632 |
| Tcp1 | ENSG00000120438 | Tf | ENSG00000117525 | Thbs1 | ENSG00000137801 |
| Timp1 | ENSG00000102265 | Tln1 | ENSG00000137076 | Tpp1 | ENSG00000166340 |
| Txnrd1 | ENSG00000198431 | Vcam1 | ENSG00000162692 | Vim | ENSG00000026025 |

## Interactors (307)

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
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| Actb | P60709 | P13569 | Actg1 | P63261 | P60709 |
| Actr2 | A7MB62 | Q95107 | Actr3 | Q99JY9 | P34152 |
| Adam15 | Q13444 | P12931 | Adam9 | Q13443 | Q99962 |
| Ahnak | Q09666-2 | Q5SY16 | Ahsg | P12763 | P17931 |
| Akap12 | Q02952 | P00533 | Alb | P02768 | P02768 |
| Aldoa | P05064 | P63101 | Anxa2 | EBI-8785901, P07355 | Q8NBP7 |
| Apoe | P02649 | P02649 | Apoh | P02749 | P08519 |
| Arg1 | P05089 | P03372 | Arhgdia | P52565 | P60953 |
| Arpc1b | O15143 | O00401 | Arpc3 | O15145 | P48552 |
| Atic | P31939 | P00533 | Atox1 | O00244 | P35670 |
| Atp6ap2 | O75787 | Q15904 | Axl | P30530 | P19174 |
| B2m | P61769 | P61769 | B4galt1 | P08037 | P29752 |
| Bag3 | O95817 | Q00613 | Basp1 | Q91XV3 | Q62108 |
| Bmp1 | P13497-2 | P07585 | Bmper | Q9W2H2 | P18824 |
| C3 | P01024-PRO_0000005911, P01024-PRO_0000005908, P01024 | P08603, P05156 | Calr | P27797 | P30101 |
| Calu | O43852 | P04049 | Cap1 | Q13114 | Q99558 |
| Capg | P40121 | Q8IUQ4 | Ccl2 | P13500 | P13501 |
| Ccn1 | P20248 | Q9H211 | Ccn2 | P29279 | P02751 |
| Ccn5 | O76076 | P49639 | Cct2 | P78371 | Q8IWZ6 |

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
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| Cct4 | P50991 | Q13882 | Cct5 | P48643 | Q13418 |
| Cct7 | P42943 | P26309 | Cd14 | EBI-11177705, EBI-11177518 | O43474 |
| Cdh2 | P15116 | P18031 | Cfl1 | P23528 | P60709 |
| Cfl2 | Q549N0, Q9Y281 | P60709 | Cltc | Q00610 | O14920 |
| Clu | P10909 | P30101 | Col1a1 | P02452 | P02751 |
| Col3a1 | P02461-1 | P09486 | Col4a1 | P08120 | O46339 |
| Col5a1 | P20908 | P01033, P08253 | Colec12 | Q5KU26 | Q9NV70 |
| Coro1c | Q9ULV4 | P19320 | Cotl1 | Q14019 | P09917 |
| Csf1 | P07141 | P05480 | Csrp1 | P21291 | Q16790 |
| Ctsa | P10619 | P08670 | Ctsb | P07858 | P02760 |
| Cxcl12 | P48061 | P78556, P13501, O15444, Q99616 | Dag1 | Q14118 | Q14118 |
| Dcn | P07585 | P02751 | Ddx39b | Q13838 | P82979, Q9Y3Y2 |
| Des | P48675 | P42930 | Dld | O08749 | Q9CQV8 |
| Dnpep | Q19087 | O17761 | Dstn | P60981 | P60709 |
| Ecm1 | Q16610 | Q9NQ94 | Eef1a1 | P68104 | Q9NYA1 |
| Eef1b | P24534 | P26641 | Eef1g | P26641, P26641-2 | P29692, P24534 |
| Eef2 | P13639 | Q16539 | Efemp1 | Q12805 | P24592 |
| Efemp2 | O95967 | Q9UBX5, P15502 | Eif4a1 | P60843 | Q6NZJ6 |
| Eif5a | P63242 | P63101 | Emilin1 | Q9Y6C2-2, Q9Y6C2 | Q00994 |
| Eno1 | P06733 | P03496 | Erp29 | P30040 | Q969S0 |
| Ezr | P15311, P31977 | Q63155 | F3 | P13726 | P08709 |
| Fbln1 | P23142 | P02647 | Fbln2 | P98095 | Q9H2F3 |
| Fbln5 | Q9UBX5 | P15502 | Fbn1 | P35555 | P15502 |
| Fermt2 | Q96AC1 | P35222 | Fkbp1a | P62942 | P36896 |
| Flna | P21333 | O14786 | Flnb | O75369 | Q13233 |
| Flnc | Q14315 | O75923 | Fmod | P13605 | P08603 |
| Fn1 | P02751 | P07585 | Fscn1 | Q16658 | P54278 |
| Fst | P19883 | P10599 | Fstl1 | Q12841 | P08571 |
| G3bp1 | Q13283 | Q04637 | Ganab | Q14697 | P04578 |
| Gapdh | P04406 | P00558 | Gdi2 | P50395 | Q8BMD2 |
| Gpc4 | O75487 | Q9NRD5 | Grn | P28799 | P98160 |
| Gsn | P06396 | P32121 | Gsto1 | P78417 | P04792 |
| Gstp1 | P09211 | P22735 | H4c1 | P62805 | P33992, P25205, P49736 |
| H4c11 | P62805 | P33992, P25205, P49736 | H4c12 | P62805 | P33992, P25205, P49736 |
| H4c14 | P62805 | P33992, P25205, P49736 | H4c2 | P62805 | P33992, P25205, P49736 |
| H4c3 | P62805 | P33992, P25205, P49736 | H4c4 | P62805 | P33992, P25205, P49736 |
| H4c6 | P62805 | P33992, P25205, P49736 | H4c8 | P62805 | P33992, P25205, P49736 |
| H4c9 | P62805 | P33992, P25205, P49736 | Hdgf | P51858 | Q07955 |
| Hexb | P07686 | P06865 | Hk1 | P16615-1 | P13569 |
| Hmox1 | P09601 | Q9NUX5 | Hnrnpa1 | P09651 | P22626 |
| Hnrnpa2b1 | P22626 | P67809 | Hnrnpa3 | P51991 | P09651 |
| Hnrnpab | Q7ZYE9 | P26599 | Hnrnpk | P61978 | P12931 |
| Hp | P00738 | P02647 | Hprt1 | P00492 | Q96G04 |
| Hsp90aa1 | P07900 | P12931 | Hsp90ab1 | P08238 | O14757 |

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
|---|---|---|---|---|---|
| Hsp90b1 | P14625 | P11021 | Hspa4 | P34932 | P11142 |
| Hspa5 | P11021 | P13569 | Hspa8 | P11142 | Q99558 |
| Hspd1 | P10809 | Q16822 | Hspe1 | P61604 | P19320 |
| Hspg2 | P98160-PRO_0000391621, P98160-PRO_0000391622, P98160 | P35968 | Htra1 | Q92743 | P10636-8 |
| Hyou1 | Q9Y4L1 | P11021 | Ifi30 | P13284 | P22735 |
| Igfbp3 | P17936 | Q86XT9 | Igfbp4 | P22692 | P05019 |
| Igfbp6 | P24592 | P24592 | Inhba | P08476 | P21674 |
| Iqgap1 | P46940 | P60709 | Isyna1 | Q9NPH2 | Q9NUX5 |
| Itgb1 | P05556 | P78536 | Itm2b | Q9Y287 | P04578 |
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| Krt76 | Q01546 | O43559 | Krt79 | Q5XKE5 | A1L190 |
| Lama4 | Q16363 | P04637 | Lamc1 | P02468 | P10493 |
| Lcn2 | P80188 | P07237 | Ldha | P00338 | P11142 |
| Ldhb | P07195 | P19320 | Lgals1 | P09382 | P35968 |
| Lgals3 | P17931 | P09237 | Lgals3bp | Q08380 | Q9BZR8 |
| Lmna | P48678 | P31750 | Lox | P28300 | Q9UBX5, P15502 |
| Lrp1 | Q07954 | P02649 | Lum | P51884 | P50281 |
| Lxn | Q9BS40 | Q9UQK1 | Mdh1 | P40925 | P00533 |
| Mdh2 | P40926 | P19320 | Me1 | P48163 | P48163 |
| Mif | P14174 | P14174 | Mmp2 | P08253 | P16035 |
| Mrc2 | Q9UBG0 | P02454 | Msn | P26038 | P16070 |
| Mtpn | P62775 | Q5XI32 | Myh9 | P35579 | O00255 |
| Myl12a | P19105 | Q14164 | Myl6 | P60660 | P19320, 18348 |
| Naca | P38879 | P15731 | Nap1l1 | P55209 | P52333 |
| Ncl | P19338 | Q00987 | Nedd4 | P46934-4 | Q9HAU4 |
| Nedd8 | Q15843 | Q8TBC4, P61081 | Nid2 | Q8IV28 | P10745 |
| Nme1 | P15531 | P10911 | Npc2 | P61916 | 16113, O15118 |
| Nucb1 | Q02818 | P10823 | Ostf1 | Q92882 | P42858 |
| P4hb | P07237 | P01137 | Pabpc1 | P11940 | Q92900 |
| Pafah1b2 | P68402 | P43034 | Pcbp1 | Q15365 | P11940 |
| Pcolce | Q15113 | P18828 | Pcsk9 | Q8NBP7 | P08253 |
| Pdcd6ip | Q8WUM4 | P12931 | Pdia3 | P30101 | P30304 |
| Pdia6 | Q15084 | P11021 | Pdlim1 | O00151 | P14136 |
| Pebp1 | P30086 | P16050 | Pf4 | P02776-PRO_0000351217, P02776 | P78556, P13501, O15444, Q99616, P48061 |
| Pfn1 | P07737 | P60709 | Pgam1 | P18669 | P12004 |
| Pgk1 | P00558, P00558-1 | O15379 | Pkm | P14618-1 | Q16665 |
| Pla1a | EBI-3954042 | P78527 | Pld3 | Q8IV08 | P19838 |
| Plod1 | Q02809 | P55795 | Plod3 | O60568 | Q9UMD9 |
| Ppia | P62937 | O00267 | Ppib | P23284 | P40855 |
| Ppic | P45877 | Q8N9N5 | Ppid | Q08752 | P63244 |
| Ppt1 | P53043 | P02829 | Prdx2 | P32119 | P10599 |
| Prdx6 | P30041 | P21796 | Prkcsh | P14314 | P04578 |
| Prnp | P10279, P04156 | P04156 | Psma1 | P25786 | P21673 |
| Psma2 | P25787 | Q9Y5K5 | Psma4 | P25789 | Q16665 |
| Psma5 | P28066 | Q9Y5K5 | Psma6 | P60900 | Q9Y5K5 |
| Psma7 | O14818 | Q16665 | Psmb2 | P49721 | Q9Y5K5 |
| Psmb3 | P49720 | Q9Y5K5 | Psmb4 | P28070 | Q9Y5K5 |

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
|---|---|---|---|---|---|
| Psmb5 | P28074 | Q9Y5K5 | Psmb6 | P28072 | Q9Y5K5 |
| Psmb8 | P28062-2 | Q13114 | Psme1 | Q06323 | Q9UL46 |
| Ptx3 | P26022 | P09038 | Rack1 | P63244 | Q14694 |
| Rad23b | P54727 | Q92681 | Rbbp4 | Q09028 | P46531 |
| Rcn1 | Q15293 | Q969Y2 | Rcn3 | Q96D15 | Q9UMX1 |
| Rdx | P35241 | P10911 | Rnh1 | P13489 | P03950 |
| Rpl10a | P62906 | Q99558 | Rpl12 | P30050 | P27824 |
| Rpl24 | P83731 | Q99558 | Rpl4 | P36578 | Q99558 |
| Rpl5 | P47962 | P23804 | Rpl8 | P62917 | Q99558 |
| Rplp0 | P05388 | P03372 | Rplp1 | P05386 | Q9GZQ8 |
| Rps12 | P25398 | P03372 | Rps14 | P62263 | Q9Y3D8 |
| Rps8 | P62241 | Q15843 | Rpsa | P08865 | P03372 |
| Rsu1 | Q15404 | Q13418 | S100a11 | P31949 | P04271 |
| S100a4 | P26447 | Q00987 | S100a6 | P06703 | Q00987 |
| Sdcbp | O00560 | P24592 | Sdf4 | Q9BRK5 | Q13418 |
| Septin11 | Q8C1B7 | Q62108 | Septin2 | B7ZR20 | Q6P5F9 |
| Serpinc1 | P01008 | P01008 | Serpine1 | P05121 | Q8NBQ5 |
| Serpinf1 | P36955 | Q9P2X3 | Serping1 | E9PK97 | Q9BRI3 |
| Serpinh1 | P50454 | P03372 | Slc9a3r1 | O14745 | P13569 |
| Sod2 | P04179 | P04179 | Spp1 | P10451 | P16070 |
| Sptbn1 | Q01082 | Q13813 | Ssc5d | A1L4H1 | Q13526 |
| Stip1 | P31948 | P07900 | Stmn1 | P16949 | P46527 |
| Sytl4 | Q96C24 | Q86TI0 | Tcp1 | P17987 | Q13882 |
| Tf | P02787 | O00501 | Tgm2 | P21980 | P02751 |
| Thbs1 | P07996-PRO_0000035842 | P16671 | Thbs2 | Q03350 | Q07954 |
| Timp1 | P01033 | P14780 | Timp2 | P16035 | P08253 |
| Tinagl1 | Q9GZM7 | O95429 | Tkt | Q16832 | P29353 |
| Tln1 | Q9Y490, P26039 | P05556 | Tmsb4x | P20065 | Q8WWQ8 |
| Tpi1 | P60174 | P12004 | Tpm4 | P67936 | Q9NRD5 |
| Tpp1 | Q96AP0 | Q92900 | Tpt1 | P13693 | P60709 |
| Trim28 | Q62318 | P12813 | Ttr | P02766 | Q15109 |
| Tubb4b | P68371 | Q5S007 | Tubb5 | P04350 | P22736 |
| Txn | P10599 | P19883 | Txnrd1 | Q16881 | Q03135 |
| U2af2 | P26368 | P82979 | Uba1 | P22314 | Q9UNE7 |
| Ube2n | P61088 | P98170 | Vasn | Q6EMK4 | P22735 |
| Vat1 | P54219-3 | Q9Y5Y5 | Vcam1 | P19320 | P40429 |
| Vcan | P13611 | P14780 | Vcl | Q64727 | Q8VI36 |
| Vcp | P55072 | O96017 | Vegfd | O43915 | Q15836 |
| Vim | P08670 | P11021 | Wdr1 | O75083 | P62993 |
| Ybx1 | P67809 | Q99697 | Ywhab | P35213 | Q9JLT6 |
| Ywhae | P62258 | Q92934 | Ywhag | P61981 | Q92934 |
| Ywhah | Q04917 | Q92934 | Ywhaq | P27348 | Q92934 |
| Ywhaz | P63104 | Q92934 | Zyx | Q15942 | P02751 |

| Input | ChEBI Id | Interacts with | Input | ChEBI Id | Interacts with |
|---|---|---|---|---|---|
| Actb | P60709 | 18348 | Actg1 | P63261 | 18348 |
| Cfl1 | P23528 | 18348 | Cltc | Q00610 | 16618 |
| Dstn | P60981 | 16618 | Ezr | P15311 | 18348 |
| Flna | P21333 | 18348 | Flnb | O75369 | 18348 |
| Flnc | Q14315 | 18348 | Igfbp3 | P17936 | 16336 |
| Iqgap1 | P46940 | 16618 | Itgb1 | P05556 | 16618 |

| Input | ChEBI Id | Interacts with |
|---|---|---|
| Kpnb1 | Q14974 | 18348 |
| Lrp1 | Q07954 | 29108 |
| Myh9 | P35579 | 18348 |
| Niban2 | Q96TA1 | 17283 |
| Pkm | P14618-1 | 18319 |
| Rdx | P35241 | 16851 |
| Sptbn1 | Q01082 | 16618 |
| Trim28 | Q13263 | 18348 |

| Input | ChEBI Id | Interacts with |
|---|---|---|
| Ldha | P00338 | 18348 |
| Msn | P26038 | 18348 |
| Myl6 | P60660 | 18348 |
| Npc2 | P61916 | 16113 |
| Rack1 | P63244 | 18348 |
| Septin2 | Q15019 | 18348 |
| Tln1 | Q9Y490 | 18348 |

# 7. Identifiers not found

These 38 identifiers were not found neither mapped to any entity in Reactome.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Aebp1 | Angptl2 | Anxa3 | C1s1 | Ccdc80 | Cd248 | Cpq | Cpxm1 |
| Ctla2a | Dpp3 | Fkbp10 | Fkbp2 | Fndc1 | Gm20431 | Gm7324 | Gm9780 |
| Hars1 | Heg1 | Hint1 | Man1a | Marcksl1 | Metrnl | Oaf | Olfml2b |
| Pdgfrl | Pdia4 | Prl7c1 | Ptms | Rexo2 | Rnase4 | Sbsn | Serpina3n |
| Srpx | Srpx2 | Svep1 | Tagln | Tgfbr3 | Twf1 | | |

reactome

# vWAT-MSC secretome from HFD mice
# Pathway Analysis Report

## Table of Contents

# 1. Introduction

Reactome is a curated database of pathways and reactions in human biology. Reactions can be considered as pathway 'steps'. Reactome defines a 'reaction' as any event in biology that changes the state of a biological molecule. Binding, activation, translocation, degradation and classical biochemical events involving a catalyst are all reactions. Information in the database is authored by expert biologists, entered and maintained by Reactome's team of curators and editorial staff. Reactome content frequently cross-references other resources e.g. NCBI, Ensembl, UniProt, KEGG (Gene and Compound), ChEBI, PubMed and GO. Orthologous reactions inferred from annotation for Homo sapiens are available for 17 non-human species including mouse, rat, chicken, puffer fish, worm, fly, yeast, rice, and Arabidopsis. Pathways are represented by simple diagrams following an SBGN-like format.

Reactome's annotated data describe reactions possible if all annotated proteins and small molecules were present and active simultaneously in a cell. By overlaying an experimental dataset on these annotations, a user can perform a pathway over-representation analysis. By overlaying quantitative expression data or time series, a user can visualize the extent of change in affected pathways and its progression. A binomial test is used to calculate the probability shown for each result, and the p-values are corrected for the multiple testing (Benjamini–Hochberg procedure) that arises from evaluating the submitted list of identifiers against every pathway.

To learn more about our Pathway Analysis, please have a look at our relevant publications:

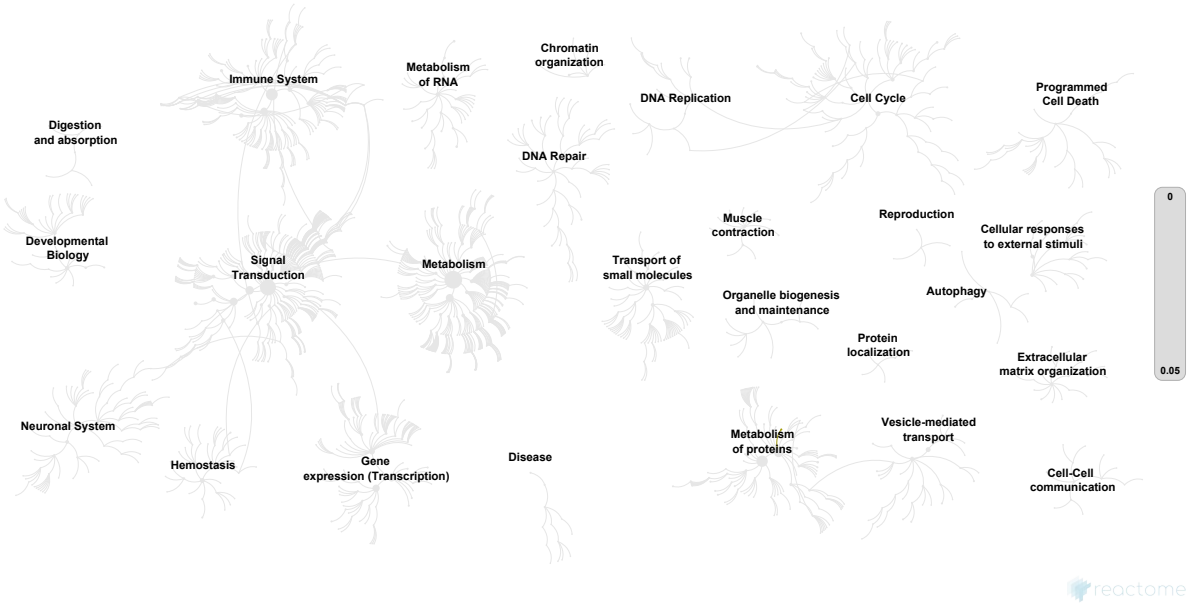
Fabregat A, Sidiropoulos K, Garapati P, Gillespie M, Hausmann K, Haw R, … D'Eustachio P (2016). The reactome pathway knowledgebase. Nucleic Acids Research, 44(D1), D481–D487. https://doi.org/10.1093/nar/gkv1351.

Fabregat A, Sidiropoulos K, Viteri G, Forner O, Marin-Garcia P, Arnau V, … Hermjakob H (2017). Reactome pathway analysis: a high-performance in-memory approach. BMC Bioinformatics, 18.

## 2. Properties

- This is an **overrepresentation** analysis: A statistical (hypergeometric distribution) test that determines whether certain Reactome pathways are over-represented (enriched) in the submitted data. It answers the question 'Does my list contain more proteins for pathway X than would be expected by chance?' This test produces a probability score, which is corrected for false discovery rate using the Benjamani-Hochberg method.
- 335 out of 354 identifiers in the sample were found in Reactome, where 8330 pathways were hit by at least one of them.
- IntAct interactors were included to increase the analysis background. This greatly increases the size of Reactome pathways, which maximises the chances of matching your submitted identifiers to the expanded pathway, but will include interactors that have not undergone manual curation by Reactome and may include interactors that have no biological significance, or unexplained relevance.
- This report is filtered to show only results for species 'Mus musculus' and resource 'all resources'.
- The unique ID for this analysis (token) is MjAyMDAzMjQxMjU5NDFfMzIwMg%3D%3D. This ID is valid for at least 7 days in Reactome's server. Use it to access Reactome services with your data.

# 3. Genome-wide overview




This figure shows a genome-wide overview of the results of your pathway analysis. Reactome pathways are arranged in a hierarchy. The center of each of the circular "bursts" is the root of one top-level pathway, for example "DNA Repair". Each step away from the center represents the next level lower in the pathway hierarchy. The color code denotes over-representation of that pathway in your input dataset. Light grey signifies pathways which are not significantly over-represented.

# 4. Most significant pathways

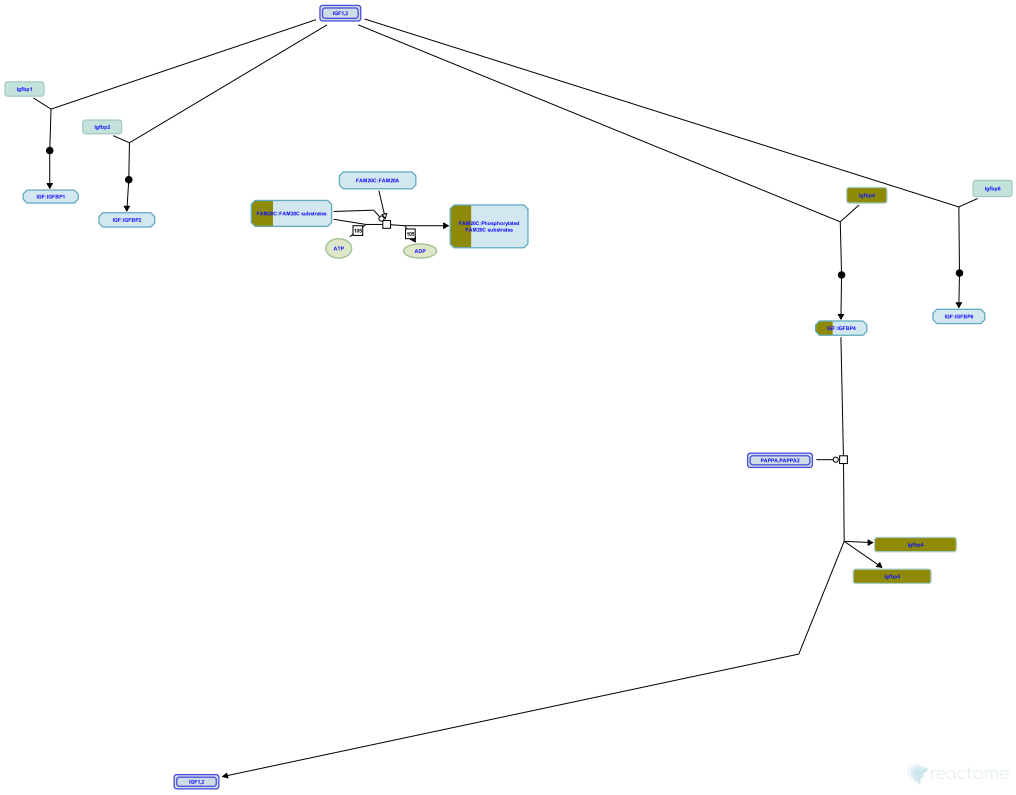
The following table shows the 25 most relevant pathways sorted by p-value.

| Pathway name | Entities | | | | Reactions | |
|---|---|---|---|---|---|---|
| | found | ratio | p-value | FDR* | found | ratio |
| Post-translational protein phosphorylation | 30 / 114 | 0.009 | 0.044 | 1 | 1 / 1 | 1.28e-04 |
| Chk1/Chk2(Cds1) mediated inactivation of Cyclin B:Cdk1 complex | 6 / 14 | 0.001 | 0.051 | 1 | 1 / 4 | 5.13e-04 |
| Regulation of ornithine decarboxylase (ODC) | 15 / 50 | 0.004 | 0.054 | 1 | 1 / 4 | 5.13e-04 |
| HSF1 activation | 5 / 11 | 9.09e-04 | 0.058 | 1 | 5 / 6 | 7.69e-04 |
| Cross-presentation of soluble exogenous antigens (endosomes) | 15 / 51 | 0.004 | 0.062 | 1 | 1 / 4 | 5.13e-04 |
| Regulation of RUNX2 expression and activity | 15 / 52 | 0.004 | 0.07 | 1 | 1 / 5 | 6.41e-04 |
| Regulation of Insulin-like Growth Factor (IGF) transport and uptake by Insulin-like Growth Factor Binding Proteins (IGFBPs) | 30 / 120 | 0.01 | 0.073 | 1 | 3 / 6 | 7.69e-04 |
| Ubiquitin-dependent degradation of Cyclin D | 15 / 53 | 0.004 | 0.079 | 1 | 1 / 3 | 3.84e-04 |
| p53-Independent DNA Damage Response | 15 / 53 | 0.004 | 0.079 | 1 | 1 / 3 | 3.84e-04 |
| Ubiquitin Mediated Degradation of Phosphorylated Cdc25A | 15 / 53 | 0.004 | 0.079 | 1 | 1 / 3 | 3.84e-04 |
| p53-Independent G1/S DNA damage checkpoint | 15 / 53 | 0.004 | 0.079 | 1 | 1 / 3 | 3.84e-04 |
| NCAM1 interactions | 8 / 24 | 0.002 | 0.086 | 1 | 1 / 3 | 3.84e-04 |
| Autodegradation of the E3 ubiquitin ligase COP1 | 15 / 54 | 0.004 | 0.089 | 1 | 1 / 5 | 6.41e-04 |
| Crosslinking of collagen fibrils | 8 / 25 | 0.002 | 0.102 | 1 | 13 / 13 | 0.002 |
| Collagen degradation | 16 / 62 | 0.005 | 0.128 | 1 | 15 / 20 | 0.003 |
| Activation of C3 and C5 | 3 / 7 | 5.79e-04 | 0.145 | 1 | 3 / 3 | 3.84e-04 |
| CDT1 association with the CDC6:ORC:origin complex | 15 / 59 | 0.005 | 0.149 | 1 | 1 / 3 | 3.84e-04 |
| Degradation of AXIN | 15 / 59 | 0.005 | 0.149 | 1 | 2 / 8 | 0.001 |
| Dectin-1 mediated noncanonical NF-kB signaling | 15 / 59 | 0.005 | 0.149 | 1 | 1 / 8 | 0.001 |
| NIK-->noncanonical NF-kB signaling | 15 / 59 | 0.005 | 0.149 | 1 | 1 / 9 | 0.001 |
| AUF1 (hnRNP D0) binds and destabilizes mRNA | 17 / 64 | 0.005 | 0.154 | 1 | 3 / 4 | 5.13e-04 |

| Pathway name | Entities | | | | Reactions | |
|---|---|---|---|---|---|---|
| | found | ratio | p-value | FDR* | found | ratio |
| Assembly of collagen fibrils and other multimeric structures | 17 / 69 | 0.006 | 0.158 | 1 | 23 / 26 | 0.003 |
| Degradation of GLI1 by the proteasome | 16 / 61 | 0.005 | 0.178 | 1 | 2 / 5 | 6.41e-04 |
| Anchoring fibril formation | 5 / 16 | 0.001 | 0.184 | 1 | 2 / 4 | 5.13e-04 |
| FBXL7 down-regulates AURKA during mitotic entry and in early mitosis | 16 / 62 | 0.005 | 0.193 | 1 | 3 / 6 | 7.69e-04 |

* False Discovery Rate

## 7. Regulation of Insulin-like Growth Factor (IGF) transport and uptake by Insulin-like Growth Factor Binding Proteins (IGFBPs) (R-MMU-381426)



**Cellular compartments:** extracellular region.

**Inferred from:** Regulation of Insulin-like Growth Factor (IGF) transport and uptake by Insulin-like Growth Factor Binding Proteins (IGFBPs).

This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

More details and caveats of the event inference in Reactome. For details on PANTHER see also: http://www.pantherdb.org/about.jsp

### References

### Edit history

| Date | Action | Author |
|---|---|---|
| 2020-03-08 | Created | Cook J |

### Entities found in this pathway (30)

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| Alb | P07724 | Apoe | P08226 | C3 | P01027 |

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
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| C4b | P01029 | Calu | O35887 | Ccn1 | P18406 |
| Cdh2 | P15116 | Csf1 | P07141 | Cst3 | P21460 |
| Fbn1 | Q61554 | Fstl1 | Q62356 | Gas6 | Q61592 |
| Hsp90b1 | P08113 | Igfbp4 | P47879 | Igfbp7 | Q61581 |
| Itih2 | Q61703 | Lamb1 | P02469 | Lamc1 | P02468 |
| Lgals1 | P16045 | Mfge8 | P21956 | Nucb1 | Q02819 |
| P4hb | P09103 | Pdia6 | Q922R8 | Prss23 | Q9D6X6 |
| Qsox1 | Q8BND5 | Rcn1 | Q05186 | Serpinc1 | P32261 |
| Spp1 | P10923 | Tf | Q921I1 | Timp1 | P12032 |

# 6. Identifiers found

Below is a list of the input identifiers that have been found or mapped to an equivalent element in Reactome, classified by resource.

## Entities (335)

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| A2m | P01023 | Acta2 | P62737 | Actb | P60711 |
| Actg1 | P63259 | Actn1 | P12814 | Actr3 | F1P679 |
| Adam9 | Q13443 | Adss2 | P30520 | Ahcy | P23526 |
| Ak2 | P54819 | Akr1a1 | P14550 | Akr1b1 | P15121 |
| Alb | P02768 | Aldoa | P04075 | Anxa1 | P07150 |
| Anxa2 | P07355 | Anxa5 | P08758 | Anxa6 | P08133 |
| Apex1 | P28352 | Apoe | P02649 | Apoh | P02749 |
| Arcn1 | Q5XJY5 | Arhgdia | F1PL93 | Arhgdib | P52566 |
| Arpc1b | E2RMT4 | Arpc2 | F1PAG6 | Arpc4 | E2QWU0 |
| Arpc5 | O15511 | Atic | P31939 | Atox1 | Q9TT99 |
| Atp5f1b | J9NT37 | Atp6ap1 | Q15904 | B2m | P61769 |
| Bgn | P21810 | Blvrb | P30043 | Bmp1 | P13497 |
| C1qa | E1BSP0 | C1qb | F1NH19 | C1qc | P02747 |
| C1ra | Q8CG16 | C3 | P01024 | C4b | P01029 |
| Calr | P27797 | Calu | O43852 | Cap1 | Q01518 |
| Capg | Q9BPX3 | Cbx3 | Q13185 | Ccl7 | Q03366 |
| Ccl9 | Q5FVN3 | Ccn1 | O00622 | Ccn2 | P29279 |
| Cd14 | P08571 | Cdh11 | P55288 | Cdh2 | P19022 |
| Cenpl | Q8N0S6 | Cfl1 | P23528 | Cfp | P27918 |
| Ckb | P12277 | Cltb | P09497 | Cmpk1 | P30085 |
| Cndp2 | Q96KP4 | Cnn2 | Q99439 | Col1a1 | P02452 |
| Col1a2 | P08123 | Col2a1 | P02458 | Col3a1 | P02461 |
| Col4a1 | P02462 | Col4a2 | P08572 | Col5a2 | P05997 |
| Col6a1 | P12109 | Col6a2 | P12110 | Col6a3 | P12111 |
| Cotl1 | Q14019 | Cpe | P16870 | Creg1 | O75629 |
| Csf1 | P09603 | Csf1r | A7Z067 | Csrp1 | P21291 |
| Cst3 | P01034 | Cstb | P04080 | Ctsa | P10619 |
| Ctsb | P07858 | Ctsd | P07339 | Ctsl | P07711 |
| Ctss | P25774 | Ctsz | Q9UBR2 | Cycs | P99999 |
| Dag1 | Q14118 | Dbi | P07108 | Ddx39b | Q13838 |
| Dld | P09622 | Dpysl2 | P47942 | Dpysl3 | Q62952 |
| Ecm1 | Q16610 | Eef1a1 | P62630 | Eef1b | P24534 |
| Eef1d | P29692 | Eef1g | P26641 | Eef2 | P13639 |
| Efemp2 | O95967 | Eif5a | P63241 | Eno1 | P06733 |
| Fabp4 | P04117 | Fabp5 | Q01469 | Fah | P16930 |
| Fam3c | Q92520 | Fbln1 | P23142 | Fbln2 | P98095 |
| Fbln5 | Q9UBX5 | Fbn1 | P35555 | Fkbp1a | P62942 |
| Flnb | A0A0G2JXT8 | Flnc | D3ZHA0 | Fscn1 | Q16658 |
| Fstl1 | Q12841 | Fth1 | P02794 | Ftl1 | P02793 |
| Gapdh | P04406 | Gas6 | Q14393 | Gdi2 | P50395 |
| Glo1 | Q04760 | Glud1 | P26443 | Gm20390 | E9PZF0 |

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
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| Gm2a | P17900 | Got1 | P17174 | Got2 | P00505 |
| Gpc1 | P35052 | Gpi | P06744 | Grn | P28799 |
| Grpel1 | Q9HAV7 | Gsn | P06396 | Gsr | P47791 |
| Gstm2 | F6Q751 | Gstp1 | P09211 | Gzme | P08884 |
| H2-D1 | P14427 | H3f3a | P84243 | H4c1 | P62805 |
| H4c11 | P62805 | H4c12 | P62805 | H4c14 | P62805 |
| H4c2 | P62805 | H4c3 | P62805 | H4c4 | P62805 |
| H4c6 | P62805 | H4c8 | P62805 | H4c9 | P62805 |
| H4f16 | P62806 | Hba | P01966 | Hdgf | P51858 |
| Hist1h4m | P62806 | Hmgb1 | P09429 | Hmox1 | P09601 |
| Hnrnpa1 | P04256 | Hnrnpa2b1 | P22626 | Hnrnpf | Q794E4 |
| Hnrnpu | Q6IMY8 | Hp | P00738 | Hprt1 | P00492 |
| Hsp90aa1 | P82995 | Hsp90ab1 | P34058 | Hsp90b1 | P14625 |
| Hspa4 | O88600 | Hspa5 | P11021 | Hspa8 | P11142 |
| Htra1 | Q92743 | Igfbp4 | P22692 | Igfbp7 | Q16270 |
| Iqgap1 | P46940 | Itgb1 | P05556 | Itgb2 | P05107 |
| Itih2 | P19823 | Itm2b | Q9Y287 | Kpnb1 | Q14974 |
| Krt1 | P04264 | Krt2 | G3MZ71 | Krt5 | F1SGG6 |
| Krt77 | G3MYU2 | Krt78 | A6QNX5 | Krt79 | Q148H7 |
| Lamb1 | P07942 | Lamc1 | P11047 | Lcp1 | P13796 |
| Ldha | P00340 | Ldhb | P00337 | Lgals1 | P09382 |
| Lgals3 | P17931 | Lgals3bp | Q08380 | Lgmn | Q9R0J8 |
| Lmna | P48678-3 | Lox | P28300 | Loxl2 | Q9Y4K0 |
| Loxl3 | P58215 | Lpl | P11151 | Lrp1 | E1BGJ0 |
| Lum | P51884 | Lyz2 | P08905 | Man2b1 | O00754 |
| Manf | P55145 | Marcks | A0A287BRL8 | Mdh1 | P40925 |
| Mdh2 | P40926 | Mfge8 | Q08431 | Mif | P14174 |
| Mmp12 | P39900 | Mmp2 | P08253 | Msn | Q9W002 |
| Mt2 | P02798 | Mydgf | Q969H8 | Myh9 | F1MQ37 |
| Myl12a | Q6ZWQ9 | Myl6 | Q60605 | Ncl | P09405 |
| Nedd8 | Q71UE8 | Nid1 | P14543 | Nid2 | Q14112 |
| Nme1 | P15531 | Npc2 | P61916 | Npepps | P55786 |
| Npm1 | P13084 | Nucb1 | Q02818 | Ogn | P20774 |
| P4hb | P07237 | Pdap1 | Q13442 | Pdcd6ip | Q8WUM4 |
| Pdia3 | F6WRR4 | Pdia6 | Q15084 | Pdxk | O00764 |
| Pea15 | Q15121 | Pebp1 | P30086 | Pfn1 | P07737 |
| Pgam1 | P18669 | Pgd | P52209 | Pgk1 | P00558 |
| Pgls | O95336 | Pgm1 | P36871 | Pkm | P14618 |
| Pla2g7 | Q5RHM0 | Plg | P00747 | Plod1 | Q02809 |
| Plod3 | O60568 | Pnp | P00491 | Ppia | P62937 |
| Ppib | P23284 | Prdx1 | P35700 | Prdx2 | Q61171 |
| Prdx5 | P99029 | Prdx6 | P30041 | Prss1 | Q9Z1R9 |
| Prss23 | O95084 | Psap | P07602 | Psma1 | P25786 |
| Psma2 | P25787 | Psma3 | P25788 | Psma4 | P25789 |
| Psma5 | P28066 | Psma6 | P60900 | Psma7 | O14818 |
| Psmb1 | P20618 | Psmb2 | P49721 | Psmb3 | P49720 |
| Psmb4 | P28070 | Psmb5 | P28074 | Psmb6 | P28072 |
| Psmb8 | P28062 | Psme1 | Q06323 | Ptgr1 | Q14914 |
| Ptx3 | P26022 | Pygl | P06737 | Qsox1 | O00391 |

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| Rad23b | Q4KMA2 | Rbbp4 | Q09028 | Rcn1 | Q15293 |
| Rdx | P35241 | Rpl12 | P30050 | Rpl19 | P84098 |
| Rpl5 | P46777 | Rpl8 | P62917 | Rplp1 | P05386 |
| Rplp2 | P05387 | Rps12 | P25398 | Rps14 | P62263 |
| Rps21 | P63220 | Rps28 | P62857 | Rps5 | P46782 |
| Rps8 | P62241 | Rpsa | P08865 | Rsu1 | D4A8F2 |
| S100a11 | P31949 | Sdcbp | O00560 | Serpinb6a | Q6P9U0 |
| Serpinc1 | P01008 | Serpine1 | P05121 | Serpine2 | A0A287AYW8 |
| Serping1 | P05155 | Serpinh1 | P50454 | Sfpq | A0A0G2K8K0 |
| Sod1 | P00441 | Sod2 | P09671 | Sod3 | O09164 |
| Spp1 | P10451 | Sptbn1 | Q62261 | Stip1 | P31948 |
| Tagln2 | P37802 | Taldo1 | P37837 | Tcn2 | P20062 |
| Tf | P02787 | Tgfbi | Q15582 | Thbs1 | P07996 |
| Thbs2 | P35442 | Timp1 | P01033 | Timp2 | P16035 |
| Tkt | P29401 | Tln1 | Q9Y490 | Tmsb4x | P62328 |
| Tpi1 | P60174 | Tpm4 | Q6IRU2 | Tubb4b | P68371 |
| Tubb5 | P07437 | Txn | P10639 | Txnrd1 | Q16881 |
| Uba1 | Q02053 | Ube2n | P61088 | Vat1 | Q99536 |
| Vcl | P18206 | Vcp | P55072 | Vim | P02543 |
| Wdr1 | O75083 | Ybx1 | P62960 | Ywhab | Q5XGC8 |
| Ywhae | P62260 | Ywhag | Q0V9W8 | Ywhah | Q28DR3 |
| Ywhaq | Q5BL40 | Ywhaz | Q6P4Z5 | | |

| Input | Ensembl Id | Input | Ensembl Id | Input | Ensembl Id |
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| Acta2 | ENSG00000107796 | Actb | ENST00000331789 | Anxa1 | ENSG00000135046 |
| Anxa2 | ENSG00000182718 | Apoe | ENSG00000130203 | Atp5f1b | ENSG00000110955 |
| B2m | ENSG00000166710 | C1qc | ENSGALP00000007599 | Calr | ENSG00000179218 |
| Ccn1 | ENSG00000145386 | Ccn2 | ENSG00000118523 | Cfl1 | ENSG00000172757 |
| Cnn2 | ENSG00000064666 | Col1a1 | ENSG00000108821 | Col1a2 | ENSG00000164692 |
| Csf1 | ENSG00000184371 | Csf1r | ENSG00000182578 | Csrp1 | ENSG00000159176 |
| Ctsd | ENSG00000117984 | Cycs | ENSG00000172115 | Fabp4 | ENSG00000170323 |
| Fscn1 | ENSG00000075618 | Fth1 | ENST00000273550 | Hdgf | ENSG00000143321 |
| Hmox1 | ENSG00000100292 | Hnrnpa2b1 | ENSG00000122566 | Hnrnpf | ENSG00000169813 |
| Hsp90aa1 | ENSG00000080824 | Hsp90b1 | ENSG00000166598 | Hspa5 | ENSG00000044574 |
| Hspa8 | ENSG00000109971 | Igfbp7 | ENSG00000163453 | Itgb1 | ENSG00000150093 |
| Itgb2 | ENSG00000160255 | Lcp1 | ENSG00000136167 | Lgals3 | ENSG00000131981 |
| Lmna | ENSG00000160789 | Lpl | ENSG00000175445 | Mif | ENSG00000240972 |
| Mmp2 | ENSG00000087245 | Msn | ENSG00000147065 | Mt2 | ENSG00000125148 |
| Mydgf | ENSG00000074842 | Pdia6 | ENSG00000143870 | Ppia | ENSG00000196262 |
| Psap | ENSG00000122852, ENSG00000185303 | Psmb8 | ENSG00000204264 | Rbbp4 | ENSG00000162521 |
| Serpine1 | ENSG00000106366 | Serpinh1 | ENSG00000149257 | Sod1 | ENSG00000142168 |
| Sod2 | ENSG00000112096 | Spp1 | ENSG00000118785 | Taldo1 | ENSG00000177156 |
| Tf | ENSG00000117525 | Thbs1 | ENSG00000137801 | Timp1 | ENSG00000102265 |
| Tln1 | ENSG00000137076 | Txnrd1 | ENSG00000198431 | Vim | ENSG00000026025 |

## Interactors (258)

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| Actb | P60709 | P13569 | Actg1 | P63261 | P23528 |
| Actn1 | P12814 | P12931 | Actr3 | Q99JY9 | P34152 |

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
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| Adam9 | Q13443 | Q99962 | Ahcy | P23526 | Q8IWL3 |
| Ahnak | Q09666-2 | Q5SY16 | Ahnak2 | Q8IVF2-3 | P24593 |
| Akap12 | Q02952 | P00533 | Alb | P02768 | P02768 |
| Aldoa | P05064 | P63101 | Anxa1 | P04083 | Q13546 |
| Anxa2 | EBI-8785901, P07355 | Q8NBP7 | Anxa6 | P14824 | P63101 |
| Apex1 | P27695 | Q09472 | Apoe | P02649 | P02649 |
| Apoh | P02749 | P08519 | Arhgdia | P52565 | P60953 |
| Arpc1b | O15143 | O00401 | Arpc4 | P59998 | O00401 |
| Arpc5 | O15511 | P00533 | Atic | P31939 | P00533 |
| Atox1 | O00244 | P35670 | Atp5f1b | P06576 | P05919 |
| Atp6ap1 | Q15904 | P27824 | B2m | P61769 | P61769 |
| Basp1 | Q91XV3 | Q62108 | Bmp1 | P13497-2 | P07585 |
| C3 | P01024-PRO_0000005911, P01024-PRO_0000005908, P01024 | P08603, P05156 | Calr | P27797 | P04792 |
| Calu | O43852 | P04049 | Cap1 | Q13114 | Q99558 |
| Capg | P40121 | Q8IUQ4 | Caprin1 | Q14444 | P03372 |
| Cbx3 | Q13185 | Q14739 | Ccn1 | P20248 | Q9H211 |
| Ccn2 | P29279 | P02751 | Cd14 | EBI-11177705, EBI-11177518 | O43474 |
| Cdh2 | P15116 | P18031 | Cenpl | P38265 | P14136 |
| Cfl1 | P45592 | P63102 | Cfl2 | Q549N0 | P23528 |
| Cfp | P27918 | O75344 | Col1a1 | P02452 | P02751 |
| Col3a1 | P02461-1 | P09486 | Col4a1 | P08120 | O46339 |
| Coro1c | Q9ULV4 | P19320 | Cotl1 | Q14019 | P09917 |
| Csf1 | P07141 | P05480 | Csf1r | P07333 | Q8CIH5 |
| Csrp1 | P21291 | Q16790 | Ctsa | P10619 | P08670 |
| Ctsb | P07858 | P02760 | Ctsd | P07339 | P04578 |
| Cycs | P99999 | Q9Y4K3 | Dag1 | Q14118 | Q14118 |
| Dbn1 | Q16643 | P60484 | Ddx39b | Q13838 | P82979, Q9Y3Y2 |
| Dld | O08749 | Q9CQV8 | Dnpep | Q19087 | O17761 |
| Dstn | P60981 | P60709 | Ecm1 | Q16610 | Q9NQ94 |
| Eef1a1 | P68104 | Q00987 | Eef1b | P24534 | P26641 |
| Eef1d | P29692 | P26641, P29692 | Eef1g | P26641, P26641-2 | P29692, P24534 |
| Eef2 | P58252 | P63101 | Efemp2 | O95967 | Q9UBX5, P15502 |
| Eif5a | P63242 | P63101 | Eno1 | P06733 | P03496 |
| Erp29 | P30040 | Q969S0 | Fabp4 | P15090 | P08670 |
| Fah | P16930 | P00533 | Fam3c | Q92520 | Q15223 |
| Fbln1 | P23142 | P02647 | Fbln2 | P98095 | Q9H2F3 |
| Fbln5 | Q9UBX5 | P15502 | Fbn1 | P35555 | P15502 |
| Fkbp1a | P62942 | P36896 | Flnb | O75369 | Q13233 |
| Flnc | Q14315 | O75923 | Fscn1 | Q16658 | P54278 |
| Fstl1 | Q12841 | P08571 | Fth1 | P02794 | P04792 |
| Gapdh | P04406 | P00558 | Gdi2 | P50395 | Q8BMD2 |
| Got1 | P17174 | P00533 | Grn | P28799 | P98160 |
| Grpel1 | Q9HAV7 | P07902 | Gsn | P06396 | P32121 |
| Gstp1 | P09211 | P22735 | H3f3a | P84243 | P49736 |
| H4c1 | P62805 | P33992, P25205, P49736 | H4c11 | P62805 | P33992, P25205, P49736 |
| H4c12 | P62805 | P33992, P25205, P49736 | H4c14 | P62805 | P33992, P25205, P49736 |

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
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| H4c4 | P62805 | P33992, P25205, P49736 | H4c6 | P62805 | P33992, P25205, P49736 |
| H4c8 | P62805 | P33992, P25205, P49736 | H4c9 | P62805 | P33992, P25205, P49736 |
| Hdgf | P51858 | Q07955 | Hmgb1 | P63158 | P13405 |
| Hmox1 | P09601 | Q9NUX5 | Hnrnpa1 | P49312 | Q3U0V1 |
| Hnrnpa2b1 | P22626 | P09651 | Hnrnpf | P52597 | O43347 |
| Hnrnpu | Q00839 | Q9NZI8 | Hp | P00738 | P02647 |
| Hprt1 | P00492 | Q96G04 | Hsp90aa1 | P07900 | Q99558 |
| Hsp90ab1 | P08238 | O14757 | Hsp90b1 | P14625 | P11021 |
| Hspa4 | P34932 | P11142 | Hspa5 | P11021 | P13569 |
| Hspa8 | P11142 | Q99558 | Hspe1 | P61604 | P19320 |
| Htra1 | Q92743 | P10636-8 | Igfbp4 | P22692 | P05019 |
| Iqgap1 | B5DFH1 | Q5M824 | Itgb1 | P05556 | P78536 |
| Itgb2 | P05107 | P00519 | Itm2b | Q9Y287 | P04578 |
| Kpnb1 | Q14974 | Q99558 | Krt1 | P04264 | P19320 |
| Krt79 | Q5XKE5 | A1L190 | Lamc1 | P02468 | P10493 |
| Lasp1 | Q14847-2 | Q8TDS5 | Ldha | P00338 | P11142 |
| Ldhb | P07195 | P19320 | Lgals1 | P09382 | P35968 |
| Lgals3 | P17931 | P09237 | Lgals3bp | Q08380 | Q9BZR8 |
| Lmna | P48678 | P31750 | Lox | P28300 | Q9UBX5, P15502 |
| Lrp1 | Q07954 | P02649 | Lum | P51884 | P50281 |
| Mdh1 | P40925 | P00533 | Mdh2 | P40926 | P19320 |
| Mif | P14174 | P14174 | Mmp2 | P08253 | P16035 |
| Msn | P26038 | P16070 | Mtpn | P62775 | Q5XI32 |
| Myh9 | P35579 | O00255 | Myl12a | P19105 | Q14164 |
| Myl6 | P60660-2 | P46940 | Naca | P38879 | P15731 |
| Ncl | P19338 | Q00987 | Nedd8 | Q15843 | Q8TBC4, P61081 |
| Nid2 | Q8IV28 | P10745 | Nme1 | P15531 | P10911 |
| Npc2 | P61916 | 16113, O15118 | Npm1 | P06748 | Q8N726 |
| Nucb1 | Q02818 | P10823 | P4hb | P07237 | P01137 |
| Pdcd5 | O14737 | Q9NRD5 | Pdcd6ip | Q8WUM4 | P17931 |
| Pdia3 | P30101 | P30304 | Pdia6 | Q15084 | P11021 |
| Pdlim1 | O00151 | P14136 | Pea15 | Q15121 | P28482 |
| Pebp1 | P30086 | P16050 | Pfn1 | P07737 | O08816 |
| Pgam1 | P18669 | P12004 | Pgk1 | P00558, P00558-1 | O15379 |
| Pkm | P14618-1 | Q16665 | Plod1 | Q02809 | P55795 |
| Plod3 | O60568 | Q9UMD9 | Pls3 | Q9NRY6 | P49639 |
| Ppia | P62937 | O00267 | Ppib | P23284 | P40855 |
| Ppic | P45877 | Q8N9N5 | Prdx1 | Q06830 | P04156 |
| Prdx2 | P32119 | P10599 | Prdx5 | P30044 | P00441 |
| Prdx6 | P30041 | P21796 | Psap | Q8IWL2 | Q9UGM3 |
| Psma1 | P25786 | P21673 | Psma2 | P25787 | Q9Y5K5 |
| Psma3 | P25788 | Q12846 | Psma4 | P25789 | Q16665 |
| Psma5 | P28066 | Q9Y5K5 | Psma6 | P60900 | Q9Y5K5 |
| Psma7 | O14818 | Q16665 | Psmb1 | P20618 | Q9Y5K5 |
| Psmb2 | P49721 | Q9Y5K5 | Psmb3 | P49720 | Q9Y5K5 |
| Psmb4 | P28070 | Q9Y5K5 | Psmb5 | P28074 | Q9Y5K5 |
| Psmb6 | P28072 | Q9Y5K5 | Psmb8 | P28062-2 | Q13114 |

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
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| Psme1 | Q06323 | Q9UL46 | Ptk7 | Q13308 | P35222 |
| Ptx3 | P26022 | P09038 | Rad23b | P54727 | P53350 |
| Rbbp4 | Q09028 | P46531 | Rcn1 | Q15293 | Q969Y2 |
| Rcn3 | Q96D15 | Q9UMX1 | Rdx | P35241 | P10911 |
| Rnh1 | P13489 | P03950 | Rpl12 | P30050 | P27824 |
| Rpl19 | P84098 | Q5S007 | Rpl5 | P47962 | P23804 |
| Rpl8 | P62917 | Q99558 | Rplp1 | P05386 | Q9GZQ8 |
| Rps12 | P25398 | P03372 | Rps14 | P62263 | Q9Y3D8 |
| Rps8 | P62241 | Q15843 | Rpsa | P08865 | P03372 |
| Rsu1 | Q15404 | P48059 | S100a11 | P31949 | P04271 |
| S100a4 | P26447 | Q00987 | S100a6 | P06703 | Q00987 |
| Sdcbp | O00560 | Q5VTY9 | Serbp1 | Q8NC51 | P67809 |
| Serpinc1 | P01008 | P01008 | Serpine1 | P05121 | Q8NBQ5 |
| Serpinf1 | P36955 | Q9P2X3 | Serping1 | E9PK97 | Q9BRI3 |
| Serpinh1 | P50454 | P03372 | Sfpq | P23246 | Q13882 |
| Sod1 | P00441 | P29692 | Sod2 | P04179 | P04179 |
| Spp1 | P10451 | P16070 | Sptbn1 | Q01082 | Q13813 |
| Stip1 | P31948 | P07900 | Tf | P02787 | O00501 |
| Thbs1 | P07996-PRO_0000035842 | P16671 | Thbs2 | Q03350 | Q07954 |
| Timp1 | P01033 | P14780 | Timp2 | P16035 | P08253 |
| Tkt | Q16832 | P29353 | Tln1 | Q9Y490, P26039 | P05556 |
| Tmsb10 | P63313 | Q9NUX5 | Tmsb4x | P20065 | Q8WWQ8 |
| Tpi1 | P60174 | P12004 | Tpm4 | P67936 | Q9NRD5 |
| Tpt1 | P13693 | P29692 | Tubb4b | P68371 | Q5S007 |
| Tubb5 | P04350 | P22736 | Txn | P10599 | P19883 |
| Txnrd1 | Q16881 | Q03135 | Uba1 | P22314 | Q9UNE7 |
| Ube2n | P61088 | Q9UNE7 | Vat1 | P54219-3 | Q9Y5Y5 |
| Vcl | Q64727 | Q8VI36 | Vcp | P55072 | O96017 |
| Vim | P08670 | P11021 | Wdr1 | O75083 | P62993 |
| Ybx1 | P67809 | Q99697 | Ywhab | P35213 | Q9JLT6 |
| Ywhae | P62258 | P30304 | Ywhag | P61981 | P30304, O14757 |
| Ywhah | Q04917 | P30304 | Ywhaq | P27348 | P30304 |
| Ywhaz | P63104 | P30304 | | | |

| Input | ChEBI Id | Interacts with | Input | ChEBI Id | Interacts with |
|---|---|---|---|---|---|
| Actb | P60709 | 16851 | Actg1 | P63261 | 16851 |
| Actn1 | P12814 | 16851 | Cfl1 | P23528 | 16851 |
| Dstn | P60981 | 16618 | Flnb | O75369 | 16851 |
| Flnc | Q14315 | 16851 | Iqgap1 | P46940 | 16618 |
| Itgb1 | P05556 | 16618 | Kpnb1 | Q14974 | 16851 |
| Ldha | P00338 | 16851 | Lrp1 | Q07954 | 29108 |
| Msn | P26038 | 16851 | Myh9 | P35579 | 16851 |
| Myl6 | P60660 | 16851 | Niban2 | Q96TA1 | 17283 |
| Npc2 | P61916 | 16113 | Pkm | P14618-1 | 18319 |
| Rdx | P35241 | 16851 | Sptbn1 | Q01082 | 16618 |
| Tln1 | Q9Y490 | 18348 | | | |

# 7. Identifiers not found

These 19 identifiers were not found neither mapped to any entity in Reactome.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Abracl | Aebp1 | Anxa3 | Cnn3 | Cpq | Dkk3 | Dpp3 | Fkbp10 |
| Fkbp2 | Gm7324 | Map4 | Pdia4 | Prl7c1 | Ptms | Rexo2 | Rnase4 |
| Tagln | Twf1 | Ufm1 | | | | | |

reactome

# sWAT-MSC secretome from HFD mice
# Pathway Analysis Report

## Table of Contents

# 1. Introduction

Reactome is a curated database of pathways and reactions in human biology. Reactions can be considered as pathway 'steps'. Reactome defines a 'reaction' as any event in biology that changes the state of a biological molecule. Binding, activation, translocation, degradation and classical biochemical events involving a catalyst are all reactions. Information in the database is authored by expert biologists, entered and maintained by Reactome's team of curators and editorial staff. Reactome content frequently cross-references other resources e.g. NCBI, Ensembl, UniProt, KEGG (Gene and Compound), ChEBI, PubMed and GO. Orthologous reactions inferred from annotation for Homo sapiens are available for 17 non-human species including mouse, rat, chicken, puffer fish, worm, fly, yeast, rice, and Arabidopsis. Pathways are represented by simple diagrams following an SBGN-like format.

Reactome's annotated data describe reactions possible if all annotated proteins and small molecules were present and active simultaneously in a cell. By overlaying an experimental dataset on these annotations, a user can perform a pathway over-representation analysis. By overlaying quantitative expression data or time series, a user can visualize the extent of change in affected pathways and its progression. A binomial test is used to calculate the probability shown for each result, and the p-values are corrected for the multiple testing (Benjamini–Hochberg procedure) that arises from evaluating the submitted list of identifiers against every pathway.

To learn more about our Pathway Analysis, please have a look at our relevant publications:

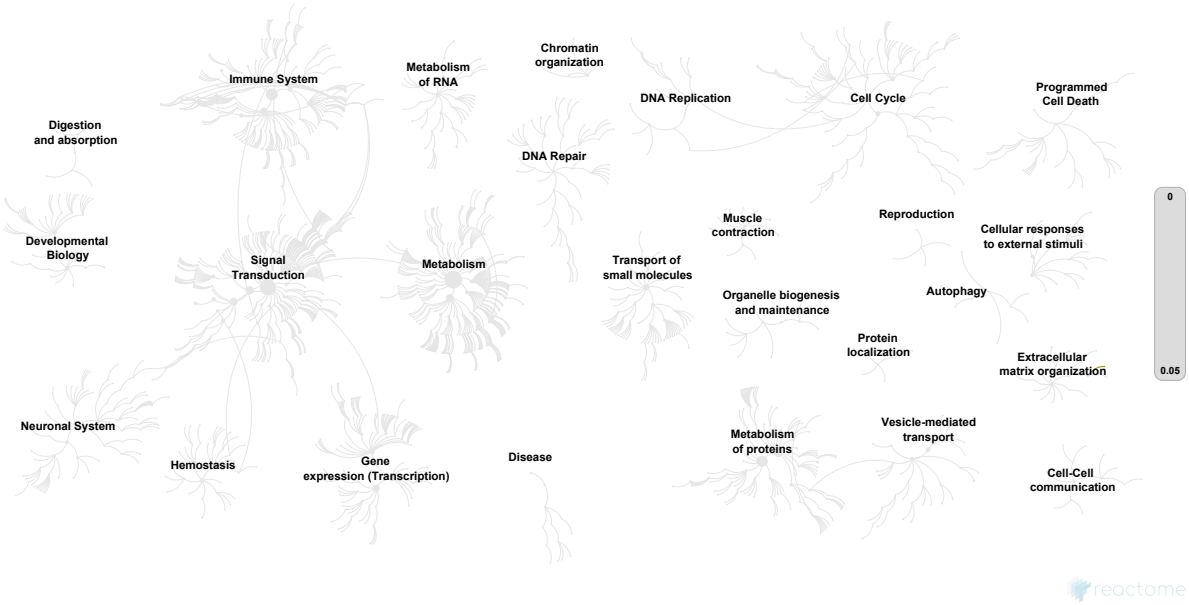
Fabregat A, Sidiropoulos K, Garapati P, Gillespie M, Hausmann K, Haw R, … D'Eustachio P (2016). The reactome pathway knowledgebase. Nucleic Acids Research, 44(D1), D481–D487. https://doi.org/10.1093/nar/gkv1351.

Fabregat A, Sidiropoulos K, Viteri G, Forner O, Marin-Garcia P, Arnau V, … Hermjakob H (2017). Reactome pathway analysis: a high-performance in-memory approach. BMC Bioinformatics, 18.

## 2. Properties

- This is an **overrepresentation** analysis: A statistical (hypergeometric distribution) test that determines whether certain Reactome pathways are over-represented (enriched) in the submitted data. It answers the question 'Does my list contain more proteins for pathway X than would be expected by chance?' This test produces a probability score, which is corrected for false discovery rate using the Benjamani-Hochberg method.
- 431 out of 474 identifiers in the sample were found in Reactome, where 9779 pathways were hit by at least one of them.
- IntAct interactors were included to increase the analysis background. This greatly increases the size of Reactome pathways, which maximises the chances of matching your submitted identifiers to the expanded pathway, but will include interactors that have not undergone manual curation by Reactome and may include interactors that have no biological significance, or unexplained relevance.
- This report is filtered to show only results for species 'Mus musculus' and resource 'all resources'.
- The unique ID for this analysis (token) is MjAyMDAzMjQxMzA0MDFfMzIwNA%3D%3D. This ID is valid for at least 7 days in Reactome's server. Use it to access Reactome services with your data.

# 3. Genome-wide overview




This figure shows a genome-wide overview of the results of your pathway analysis. Reactome pathways are arranged in a hierarchy. The center of each of the circular "bursts" is the root of one top-level pathway, for example "DNA Repair". Each step away from the center represents the next level lower in the pathway hierarchy. The color code denotes over-representation of that pathway in your input dataset. Light grey signifies pathways which are not significantly over-represented.

# 4. Most significant pathways

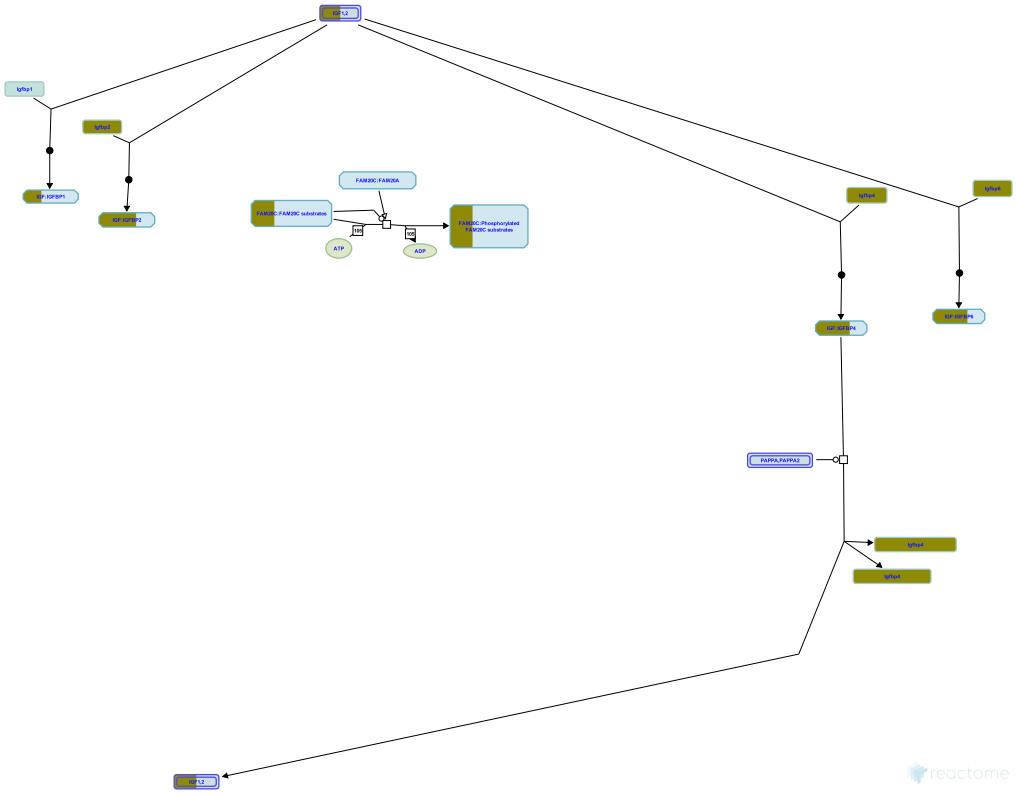
The following table shows the 25 most relevant pathways sorted by p-value.

| Pathway name | Entities | | | | Reactions | |
|---|---|---|---|---|---|---|
| | found | ratio | p-value | FDR* | found | ratio |
| Crosslinking of collagen fibrils | 11 / 25 | 0.002 | 0.047 | 1 | 13 / 13 | 0.002 |
| Antagonism of Activin by Follistatin | 3 / 4 | 3.31e-04 | 0.076 | 1 | 2 / 2 | 2.56e-04 |
| Laminin interactions | 11 / 29 | 0.002 | 0.105 | 1 | 7 / 8 | 0.001 |
| Chk1/Chk2(Cds1) mediated inactivation of Cyclin B:Cdk1 complex | 6 / 14 | 0.001 | 0.132 | 1 | 1 / 4 | 5.13e-04 |
| HSF1 activation | 5 / 11 | 9.09e-04 | 0.136 | 1 | 5 / 6 | 7.69e-04 |
| Regulation of Insulin-like Growth Factor (IGF) transport and uptake by Insulin-like Growth Factor Binding Proteins (IGFBPs) | 35 / 120 | 0.01 | 0.169 | 1 | 6 / 6 | 7.69e-04 |
| Cross-presentation of soluble exogenous antigens (endosomes) | 16 / 51 | 0.004 | 0.191 | 1 | 4 / 4 | 5.13e-04 |
| AUF1 (hnRNP D0) binds and destabilizes mRNA | 20 / 64 | 0.005 | 0.229 | 1 | 3 / 4 | 5.13e-04 |
| Dissolution of Fibrin Clot | 6 / 17 | 0.001 | 0.24 | 1 | 17 / 18 | 0.002 |
| Post-translational protein phosphorylation | 32 / 114 | 0.009 | 0.24 | 1 | 1 / 1 | 1.28e-04 |
| Regulation of ornithine decarboxylase (ODC) | 15 / 50 | 0.004 | 0.249 | 1 | 1 / 4 | 5.13e-04 |
| Assembly of collagen fibrils and other multimeric structures | 20 / 69 | 0.006 | 0.253 | 1 | 20 / 26 | 0.003 |
| Association of TriC/CCT with target proteins during biosynthesis | 4 / 11 | 9.09e-04 | 0.284 | 1 | 1 / 1 | 1.28e-04 |
| Elastic fibre formation | 13 / 44 | 0.004 | 0.285 | 1 | 13 / 16 | 0.002 |
| Regulation of RUNX2 expression and activity | 15 / 52 | 0.004 | 0.296 | 1 | 1 / 5 | 6.41e-04 |
| Ubiquitin-dependent degradation of Cyclin D | 15 / 53 | 0.004 | 0.321 | 1 | 1 / 3 | 3.84e-04 |
| p53-Independent G1/S DNA damage checkpoint | 15 / 53 | 0.004 | 0.321 | 1 | 1 / 3 | 3.84e-04 |
| p53-Independent DNA Damage Response | 15 / 53 | 0.004 | 0.321 | 1 | 1 / 3 | 3.84e-04 |
| Ubiquitin Mediated Degradation of Phosphorylated Cdc25A | 15 / 53 | 0.004 | 0.321 | 1 | 1 / 3 | 3.84e-04 |
| Autodegradation of the E3 ubiquitin ligase COP1 | 15 / 54 | 0.004 | 0.346 | 1 | 1 / 5 | 6.41e-04 |
| Anchoring fibril formation | 5 / 16 | 0.001 | 0.354 | 1 | 2 / 4 | 5.13e-04 |
| NCAM1 interactions | 7 / 24 | 0.002 | 0.373 | 1 | 1 / 3 | 3.84e-04 |

| Pathway name | Entities | | | | Reactions | |
|---|---|---|---|---|---|---|
| | found | ratio | p-value | FDR* | found | ratio |
| Transport of gamma-carboxylated protein precursors from the endoplasmic reticulum to the Golgi apparatus | 3 / 9 | 7.44e-04 | 0.378 | 1 | 3 / 9 | 0.001 |
| Removal of aminoterminal propeptides from gamma-carboxylated proteins | 3 / 10 | 8.27e-04 | 0.442 | 1 | 3 / 9 | 0.001 |
| Collagen formation | 27 / 106 | 0.009 | 0.442 | 1 | 47 / 76 | 0.01 |

* False Discovery Rate

## 6. Regulation of Insulin-like Growth Factor (IGF) transport and uptake by Insulin-like Growth Factor Binding Proteins (IGFBPs) (R-MMU-381426)



**Cellular compartments:** extracellular region.

**Inferred from:** Regulation of Insulin-like Growth Factor (IGF) transport and uptake by Insulin-like Growth Factor Binding Proteins (IGFBPs).

This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

More details and caveats of the event inference in Reactome. For details on PANTHER see also: http://www.pantherdb.org/about.jsp

### References

### Edit history

| Date | Action | Author |
|---|---|---|
| 2020-03-08 | Created | Cook J |

### Entities found in this pathway (35)

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| Ahsg | P29699 | Alb | P07724 | C3 | P01027 |

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| Calu | O35887 | Ccn1 | P18406 | Cdh2 | P15116 |
| Csf1 | P07141 | Cst3 | P21460 | F5 | O88783 |
| Fbn1 | Q61554 | Fstl1 | Q62356 | Gas6 | Q61592 |
| Hsp90b1 | P08113 | Igf2 | P09535 | Igfbp2 | P47877 |
| Igfbp4 | P47879 | Igfbp6 | P47880 | Igfbp7 | Q61581 |
| Itih2 | Q61703 | Lamb1 | P02469 | Lamb2 | Q61292 |
| Lamc1 | P02468 | Lgals1 | P16045 | Mfge8 | P21956 |
| Nucb1 | Q02819 | P4hb | P09103 | Pcsk9 | Q80W65 |
| Pdia6 | Q922R8 | Prkcsh | O08795 | Qsox1 | Q8BND5 |
| Rcn1 | Q05186 | Serpinc1 | P32261 | Tf | Q921I1 |
| Timp1 | P12032 | Vcan | Q62059 | | |

# 6. Identifiers found

Below is a list of the input identifiers that have been found or mapped to an equivalent element in Reactome, classified by resource.

## Entities (431)

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| A2m | P01023 | Acta2 | P62739 | Actb | P60709 |
| Actg1 | P63259 | Actn1 | P12814 | Actn4 | O43707 |
| Actr2 | P61160 | Actr3 | F1P679 | Adam12 | O43184 |
| Adam9 | Q13443 | Adamts1 | Q9UHI8 | Adamts5 | Q9UNA0 |
| Adss2 | P30520 | Ahsg | P02765 | Aimp1 | Q12904 |
| Ak1 | P00568 | Ak2 | P54819 | Akr1a1 | P14550 |
| Akr1b1 | P15121 | Alb | P02768 | Aldoa | P04075 |
| Anxa1 | P04083 | Anxa2 | Q07936 | Anxa5 | P08758 |
| Anxa6 | P08133 | Apoh | P02749 | Arhgdia | F1PL93 |
| Arhgdib | P52566 | Arpc1b | E2RMT4 | Arpc2 | F1PAG6 |
| Arpc4 | E2QWU0 | Arpc5 | O15511 | Asah1 | Q13510 |
| Asl | P04424 | Atic | P31939 | Atox1 | Q9TT99 |
| Atp5f1b | J9NT37 | Axl | F1PGV4 | B2m | P61769 |
| B4galt1 | P15291 | Bag3 | Q5U2U8 | Banf1 | O75531 |
| Bgn | P21810 | Blvrb | P30043 | Bmp1 | P13497 |
| C1ra | Q8CG16 | C3 | P01024 | Calr | P27797 |
| Calu | O43852 | Cand1 | Q86VP6 | Canx | P35564 |
| Cap1 | Q01518 | Capg | Q9BPX3 | Capza1 | A4FUA8 |
| Capza2 | Q5E997 | Ccl2 | P13500 | Ccl7 | Q03366 |
| Ccl8 | Q09141 | Ccn1 | O00622 | Ccn2 | P29279 |
| Cct2 | P78371 | Cct3 | P49368 | Cct4 | P50991 |
| Cct5 | P48643 | Cdc37 | Q16543 | Cdc42 | P60953 |
| Cdh11 | P55288 | Cdh2 | P19022 | Cfl1 | P23528 |
| Ckb | P12277 | Cltc | Q00610 | Cmpk1 | P30085 |
| Cndp2 | Q96KP4 | Cnn2 | Q99439 | Col1a1 | P02452 |
| Col1a2 | P08123 | Col3a1 | P02461 | Col4a1 | P02462 |
| Col4a2 | P08572 | Col5a2 | P05997 | Col6a1 | P12109 |
| Col6a2 | P12110 | Col6a3 | P12111 | Colec12 | Q5KU26 |
| Cotl1 | Q14019 | Cox6b1 | P14854 | Cpe | P16870 |
| Creg1 | O75629 | Crk | A0A287A2R9 | Crlf1 | F1ML91 |
| Csf1 | P09603 | Csrp1 | P21291 | Cst3 | P01034 |
| Cst6 | P04080 | Cstb | P04080 | Ctsa | P10619 |
| Ctsb | P07858 | Ctsh | P09668 | Ctsl | P07711 |
| Ctss | P25774 | Ctsz | Q9UBR2 | Cxcl5 | P50228 |
| Cycs | P99999 | Dag1 | Q14118 | Dbi | P07108 |
| Dcn | P07585 | Ddah1 | P56965 | Dld | P09622 |
| Dpysl2 | P47942 | Ecm1 | Q16610 | Eef1a1 | P62630 |
| Eef1b | P24534 | Eef1g | P26641 | Eef2 | P13639 |
| Efemp1 | Q12805 | Efemp2 | O95967 | Efhd2 | F1SUW2 |
| Egfr | A0A286ZV23 | Ehd1 | Q9WVK4 | Eif2s1 | P05198 |
| Eif5a | P63241 | Emilin1 | Q9Y6C2 | Emilin2 | Q9BXX0 |

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
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| Eno1 | P06733 | Ero1a | E2RNW5 | Erp44 | Q9BS26 |
| Ext1 | Q16394 | Ext2 | Q93063 | F2 | J9NSF9 |
| F3 | P13726 | F5 | P12259 | Fabp5 | Q01469 |
| Fah | P16930 | Fam3c | Q92520 | Fbln1 | P23142 |
| Fbln2 | P98095 | Fbln5 | Q9UBX5 | Fbn1 | P35555 |
| Fdps | Q920E5 | Fgfr1 | P11362 | Fh | P07954 |
| Fhl2 | Q14192 | Fkbp1a | P62942 | Flna | P21333 |
| Flnb | A0A0G2JXT8 | Flnc | D3ZHA0 | Fmod | Q06828 |
| Fscn1 | Q16658 | Fst | P47931 | Fstl1 | Q12841 |
| Fth1 | P02794 | Ftl1 | P02793 | G6pdx | Q00612 |
| Galnt2 | Q10471 | Gapdh | P04406 | Gars1 | P41250 |
| Gas6 | Q14393 | Gclm | P48507 | Gdi1 | P31150 |
| Gdi2 | P50395 | Glb1 | P16278 | Glo1 | J9NRV6 |
| Gm20390 | E9PZF0 | Gm2a | P17900 | Gmfb | F6WBZ2 |
| Got1 | P17174 | Got2 | P00505 | Gpc1 | P35052 |
| Gpi | P06744 | Grn | P28799 | Grpel1 | Q9HAV7 |
| Gsn | P06396 | Gsr | P00390-2 | Gstm1 | A4IFG0, Q9N0V4 |
| Gstm2 | F6Q751 | Gsto1 | P78417 | Gstp1 | P09211 |
| H4c1 | P62805 | H4c11 | P62805 | H4c12 | P62805 |
| H4c14 | P62805 | H4c2 | P62805 | H4c3 | P62805 |
| H4c4 | P62805 | H4c6 | P62805 | H4c8 | P62805 |
| H4c9 | P62805 | H4f16 | P62804 | Hexa | P06865 |
| Hexb | P07686 | Hist1h2bq | G3V8B3 | Hist1h4m | P62804 |
| Hmox1 | P09601 | Hnrnpa1 | F6XNZ3 | Hnrnpa2b1 | P22626 |
| Hnrnpk | P61979 | Hprt1 | P00492 | Hsp90aa1 | P82995 |
| Hsp90ab1 | P34058 | Hsp90b1 | P14625 | Hspa1a | P0DMV8 |
| Hspa4 | O88600 | Hspa5 | P11021 | Hspa8 | P11142 |
| Hspb1 | P14602 | Hspd1 | P63038 | Hspg2 | P98160 |
| Htra1 | Q92743 | Hyou1 | Q9Y4L1 | Idh1 | O75874 |
| Igf2 | P01344 | Igfbp2 | P47877 | Igfbp4 | P22692 |
| Igfbp6 | P47880 | Igfbp7 | Q16270 | Inhba | Q04998 |
| Inhbb | Q04999 | Iqgap1 | P46940 | Itga5 | P08648 |
| Itgb1 | P05556 | Itih2 | P19823 | Itm2b | Q9Y287 |
| Kars1 | Q15046 | Kpnb1 | Q14974 | Krt1 | P04264 |
| Krt10 | E1C6Q9 | Krt2 | G3MZ71 | Krt77 | G3MYU2 |
| Krt78 | A6QNX5 | Lama2 | P24043 | Lama4 | Q16363 |
| Lamb1 | P07942 | Lamb2 | P11047, P55268 | Lamc1 | P11047 |
| Lap3 | Q01532 | Lcp1 | P13796 | Ldha | P00340 |
| Lgals1 | P09382 | Lgals3 | P17931 | Lgals3bp | Q08380 |
| Lgmn | Q9R0J8 | Lmna | P48678-3 | Lox | P28300 |
| Loxl1 | Q08397 | Loxl2 | Q9Y4K0 | Loxl3 | P58215 |
| Lrp1 | E1BGJ0 | Lta4h | P09960 | Lum | P51884 |
| Lyz2 | P08905 | Man2a1 | Q16706 | Man2b1 | O00754 |
| Mapk1 | P28482 | Mapre1 | Q61166 | Marcks | A0A287BRL8 |
| Mdh1 | P40925 | Mdh2 | P40926 | Mfap5 | Q13361 |
| Mfge8 | Q08431 | Mif | P14174 | Minpp1 | Q9UNW1 |
| Mmp12 | P39900 | Mmp2 | P08253 | Mmp3 | P08254 |
| Mrc2 | Q9UBG0 | Msn | Q9W002 | Mt1 | O19000 |
| Mt2 | P02798 | Mtap | Q13126 | Myh9 | F1MQ37 |

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| Myl12a | Q6ZWQ9 | Myl9 | Q1LZF9 | Naglu | P54802 |
| Naxe | Q8NCW5 | Ncl | P09405 | Nedd8 | Q71UE8 |
| Neo1 | F7B3P5 | Nid1 | P14543 | Nid2 | Q14112 |
| Nme1 | P15531 | Npepps | P55786 | Npm1 | P13084 |
| Nrp1 | A4III3 | Ntf3 | P20783 | Nucb1 | Q02818 |
| Ogn | P20774 | Ostf1 | Q92882 | P4ha2 | O15460 |
| P4hb | P07237 | Pabpc1 | P29341 | Pafah1b1 | P43034 |
| Pcolce | Q15113 | Pcsk9 | Q8NBP7 | Pdap1 | Q13442 |
| Pdia3 | P27773 | Pdia6 | Q15084 | Pea15 | Q15121 |
| Pebp1 | P30086 | Pfn1 | P07737 | Pgam1 | P18669 |
| Pgd | P52209 | Pgk1 | P00558 | Pgls | O95336 |
| Pgm1 | P36871 | Pgm2 | Q96G03 | Pgp | A6NDG6 |
| Pkm | P14618 | Pla1a | Q53H76 | Plau | P29598 |
| Pld3 | Q9VIF2 | Plg | P00747 | Plod1 | Q02809 |
| Plod2 | O00469 | Plod3 | O60568 | Ppia | P62937 |
| Ppib | P23284 | Ppid | F1RTY6 | Ppp2r1a | P30153 |
| Prdx2 | Q61171 | Prdx5 | P99029 | Prdx6 | P30041 |
| Prkcsh | P14314 | Prnp | P04156 | Pros1 | P07225 |
| Psma1 | P25786 | Psma2 | P25787 | Psma3 | P25788 |
| Psma4 | P25789 | Psma5 | P28066 | Psma6 | P60900 |
| Psma7 | O14818 | Psmb1 | P20618 | Psmb2 | P49721 |
| Psmb3 | P49720 | Psmb4 | P28070 | Psmb5 | P28074 |
| Psmb6 | P28072 | Psmb7 | Q99436 | Psmc2 | P35998 |
| Ptgr1 | Q14914 | Ptpa | P9WIA1 | Ptx3 | P26022 |
| Pxdn | Q92626 | Pygl | P06737 | Qsox1 | O00391 |
| Rab7a | P51149 | Rac1 | P63000 | Rack1 | P63243 |
| Rad23b | P54728 | Ran | P62828 | Rcn1 | Q15293 |
| Rdx | E9PT65 | Rpl12 | P30050 | Rpl19 | P84098 |
| Rpl23a | P62750 | Rpl24 | P83731 | Rpl30 | P62888 |
| Rpl4 | P36578 | Rpl5 | P46777 | Rpl7a | P62424 |
| Rplp0 | P05388 | Rplp1 | P05386 | Rplp2 | P05387 |
| Rps28 | P62857 | Rps5 | P46782 | Rps8 | P62241 |
| Rpsa | P08865 | Rsu1 | D4A8F2 | S100a10 | P05943 |
| S100a11 | P31949 | Sdcbp | O00560 | Sema7a | F1NIZ9 |
| Serpinb6a | Q6P9U0 | Serpinc1 | P01008 | Serpine1 | P05121 |
| Serpine2 | P07092 | Serping1 | P05155 | Serpinh1 | P50454 |
| Slit3 | F1RR92 | Sod2 | P09671 | Sod3 | O09164 |
| Spon2 | Q9BUD6 | Sptbn1 | Q62261 | Stip1 | P31948 |
| Tagln2 | P37802 | Taldo1 | P37837 | Tars1 | P26639 |
| Tcn2 | P20062 | Tf | P02787 | Thbs1 | P07996 |
| Thbs2 | P35442 | Thy1 | P04216 | Timp1 | P01033 |
| Timp2 | P16035 | Tkt | P29401 | Tln1 | Q9Y490 |
| Tmpo | P42167-1 | Tmsb4x | P62328 | Tpi1 | P60174 |
| Tpm4 | Q6IRU2 | Tpp1 | Q96AP0 | Tubb4b | P68371 |
| Tubb5 | P04350 | Tubb6 | Q9BUF5 | Txn | P08629 |
| Txnrd1 | Q16881 | Uap1 | Q16222 | Uba1 | Q02053 |
| Ube2n | P61088 | Ugp2 | Q91ZJ5 | Usp14 | Q5U2N2 |
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| Vcan | P13611 | Vcl | P18206 | Vcp | P55072 |

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
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| Wdr1 | O75083 | Xdh | F1S3Y7 | Xpnpep1 | Q54G06 |
| Ybx1 | P62960 | Ywhab | F1SDR7 | Ywhae | P62260 |
| Ywhag | F2Z4Z1 | Ywhah | F2Z4Y1 | Ywhaq | F1SA98 |
| Ywhaz | F2Z558 | Zyx | Q9N675 | | |

| Input | Ensembl Id | Input | Ensembl Id | Input | Ensembl Id |
|---|---|---|---|---|---|
| Acta2 | ENSG00000107796 | Actb | ENST00000331789 | Anxa1 | ENSG00000135046 |
| Anxa2 | ENSG00000182718 | Atp5f1b | ENSG00000110955 | B2m | ENSG00000166710 |
| Calr | ENSG00000179218 | Capza1 | ENSG00000116489 | Ccl2 | ENSG00000108691 |
| Ccn1 | ENSG00000145386 | Ccn2 | ENSG00000118523 | Cdc42 | ENSG00000070831 |
| Cfl1 | ENSG00000172757 | Cnn2 | ENSG00000064666 | Col1a1 | ENSG00000108821 |
| Col1a2 | ENSG00000164692 | Csf1 | ENSG00000184371 | Csrp1 | ENSG00000159176 |
| Cycs | ENSG00000172115 | Egfr | ENSG00000146648 | F3 | ENSG00000117525 |
| Fdps | ENSG00000160752 | Fhl2 | ENSG00000115641 | Fscn1 | ENSG00000075618 |
| Fth1 | ENST00000273550 | Gsto1 | ENSG00000148834 | Hmox1 | ENSG00000100292 |
| Hnrnpa2b1 | ENSG00000122566 | Hsp90aa1 | ENSG00000080824 | Hsp90b1 | ENSG00000166598 |
| Hspa1a | ENSG00000204389, ENSG00000215328, ENSG00000234475, ENSG00000235941, ENSG00000237724 | Hspa5 | ENSG00000044574 | Hspa8 | ENSG00000109971 |
| Hspb1 | ENSG00000106211 | Hspd1 | ENSG00000144381 | Hyou1 | ENSG00000149428 |
| Igf2 | ENST00000337883, ENST00000381406 | Igfbp7 | ENSG00000163453 | Itga5 | ENSG00000161638 |
| Itgb1 | ENSG00000150093 | Lcp1 | ENSG00000136167 | Lgals3 | ENSG00000131981 |
| Lmna | ENSG00000160789 | Mif | ENSG00000240972 | Mmp2 | ENSG00000087245 |
| Mmp3 | ENSG00000149968 | Msn | ENSG00000147065 | Mt2 | ENSG00000125148 |
| Mtap | ENSG00000099810 | Myl9 | ENSG00000101335 | Pdia6 | ENSG00000143870 |
| Ppia | ENSG00000196262 | Rplp0 | ENSG00000089157 | Serpine1 | ENSG00000106366 |
| Serpinh1 | ENSG00000149257 | Sod2 | ENSG00000112096 | Taldo1 | ENSG00000177156 |
| Tf | ENSG00000117525 | Thbs1 | ENSG00000137801 | Timp1 | ENSG00000102265 |
| Tln1 | ENSG00000137076 | Tpp1 | ENSG00000166340 | Txnrd1 | ENSG00000198431 |
| Vapa | ENST00000340541 | Vcam1 | ENSG00000162692 | Vegfa | ENSG00000112715 |
| Vim | ENSG00000026025 | | | | |

## Interactors (336)

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
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| Actb | P60709 | P13569 | Actg1 | P63261 | P23528 |
| Actn1 | P12814 | P12931 | Actn4 | O43707 | Q07157 |
| Actr2 | A7MB62 | Q95107 | Actr3 | Q99JY9 | P34152 |
| Adam12 | O43184-2 | O95633 | Adam9 | Q13443 | Q99962 |
| Ahnak | Q09666 | P00533 | Ahsg | P12763 | P17931 |
| Aimp1 | Q12904-2 | Q96CV9 | Akap12 | Q02952 | P00533 |
| Alb | P02768 | P02768 | Aldoa | P05064 | P63101 |
| Anxa1 | P04083 | Q13546 | Anxa2 | EBI-8785901, P07355 | Q8NBP7 |
| Anxa6 | P14824 | P63101 | Apoh | P02749 | P08519 |
| Arhgdia | P52565 | P60953 | Arpc1b | O15143 | O00401 |
| Arpc4 | P59998 | O00401 | Arpc5 | O15511 | P00533 |
| Atic | P31939 | P00533 | Atox1 | O00244 | P35670 |
| Atp5f1b | P06576 | P05919 | Axl | P30530 | P19174 |

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
|---|---|---|---|---|---|
| B2m | P61769 | P61769 | B4galt1 | P08037 | P29752 |
| Bag3 | O95817 | Q00613 | Banf1 | O75531 | O75531 |
| Basp1 | Q91XV3 | Q62108 | Bmp1 | P13497-2 | P07585 |
| Bmper | Q9W2H2 | P18824 | C3 | P01024-PRO_0000005911, P01024-PRO_0000005908, P01024 | P08603, P05156 |
| Calr | P27797 | P30101 | Calu | O43852 | P04049 |
| Cand1 | Q86VP6 | P62877, Q13616 | Canx | P27824 | P13569 |
| Cap1 | Q13114 | Q99558 | Capg | P40121 | Q8IUQ4 |
| Capza1 | P47753, P13127 | Q9Y5K6 | Capza2 | P47755 | P52907 |
| Ccl2 | P13500 | P13501 | Ccn1 | P20248 | Q9H211 |
| Ccn2 | P29279 | P02751 | Ccn3 | P48745 | O43559 |
| Ccn4 | O95388 | P49639 | Ccn5 | O76076 | P49639 |
| Cct2 | P78371 | Q8IWZ6 | Cct3 | P49368 | Q13882 |
| Cct4 | P50991 | Q13882 | Cct5 | P48643 | P17987 |
| Cdc37 | Q16543 | Q99558 | Cdc42 | P60953 | Q13177 |
| Cdh2 | P15116 | P18031 | Cfl1 | P23528 | P53667 |
| Cfl2 | Q549N0 | P23528 | Cltc | Q00610 | P11142 |
| Col1a1 | P02452 | P02751 | Col3a1 | P02461-1 | P09486 |
| Col4a1 | P08120 | O46339 | Colec12 | Q5KU26 | Q9NV70 |
| Coro1c | Q9ULV4 | P19320 | Cotl1 | Q14019 | P09917 |
| Crk | P46108 | P16234 | Csf1 | P07141 | P05480 |
| Csrp1 | P21291 | Q16790 | Cst6 | Q15828 | O95070 |
| Ctsa | P10619 | P08670 | Ctsb | P07858 | P02760 |
| Cuta | O60888 | P22736 | Cycs | P99999 | Q9Y4K3 |
| Dag1 | Q14118 | Q14118 | Dcn | P07585 | P02751 |
| Dld | O08749 | Q9CQV8 | Dnpep | Q19087 | O17761 |
| Dstn | P60981 | P60709 | Ecm1 | Q16610 | Q9NQ94 |
| Eef1a1 | P68104 | Q9NYA1 | Eef1b | P24534 | P26641 |
| Eef1g | P26641, P26641-2 | P29692, P24534 | Eef2 | P58252 | P63101 |
| Efemp1 | Q12805 | P24592 | Efemp2 | O95967 | Q9UBX5, P15502 |
| Egfr | P00533 | P11021 | Ehd1 | Q9H4M9 | 16618, Q9H1K0 |
| Eif2s1 | P05198 | Q9Z2B5 | Eif5a | P63242 | P63101 |
| Emilin1 | Q9Y6C2-2, Q9Y6C2 | Q00994 | Eno1 | P06733 | P03496 |
| Ero1a | Q96HE7 | P07237 | Erp29 | P30040 | Q969S0 |
| F3 | P13726 | P08709 | Fah | P16930 | P00533 |
| Fam3c | Q92520 | Q15223 | Fbln1 | P23142 | P02647 |
| Fbln2 | P98095 | Q9H2F3 | Fbln5 | Q9UBX5 | P15502 |
| Fbn1 | P35555 | P15502 | Fdps | P14324 | Q9BRI3 |
| Fgfr1 | P11362 | P23352 | Fh | P07954 | P21673 |
| Fhl1 | Q13642 | P04156 | Fhl2 | O35115 | Q91V26 |
| Fkbp1a | P62942 | P36896 | Flna | P21333 | O14786 |
| Flnb | O75369 | Q13233 | Flnc | Q14315 | O75923 |
| Fmod | P13605 | P08603 | Fscn1 | Q16658 | P54278 |
| Fst | P19883 | P10599 | Fstl1 | Q12841 | P08571 |
| Fth1 | P02794 | P04792 | Galnt2 | Q10471 | Q9HC36 |
| Gapdh | P04406 | P00558 | Gdi1 | P31150 | P51149 |
| Gdi2 | P50395 | Q8BMD2 | Glb1 | P16278 | P08670 |
| Got1 | P17174 | P00533 | Grn | P28799 | P98160 |

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
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| Grpel1 | Q9HAV7 | P07902 | Gsn | P06396 | P32121 |
| Gsto1 | P78417 | P04792 | Gstp1 | P09211 | P22735 |
| H4c1 | P62805 | P33992, P25205, P49736 | H4c11 | P62805 | P33992, P25205, P49736 |
| H4c12 | P62805 | P33992, P25205, P49736 | H4c14 | P62805 | P33992, P25205, P49736 |
| H4c2 | P62805 | P33992, P25205, P49736 | H4c3 | P62805 | P33992, P25205, P49736 |
| H4c4 | P62805 | P33992, P25205, P49736 | H4c6 | P62805 | P33992, P25205, P49736 |
| H4c8 | P62805 | P33992, P25205, P49736 | H4c9 | P62805 | P33992, P25205, P49736 |
| Hexb | P07686 | P06865 | Hmox1 | P09601 | Q9NUX5 |
| Hnrnpa1 | P09651 | P22626 | Hnrnpa2b1 | P22626 | P67809 |
| Hnrnpk | P61978 | P12931 | Hprt1 | P00492 | Q96G04 |
| Hsp90aa1 | P07900 | Q15185 | Hsp90ab1 | P08238 | O14757 |
| Hsp90b1 | P14625 | P11021 | Hspa1a | P0DMV8 | P13569 |
| Hspa4 | P34932 | P11142 | Hspa5 | P11021 | P13569 |
| Hspa8 | P11142 | Q99558 | Hspb1 | P04792 | P31749 |
| Hspd1 | P10809 | Q16822 | Hspe1 | P61604 | P19320 |
| Hspg2 | P98160-PRO_0000391621, P98160-PRO_0000391622, P98160 | P35968 | Htra1 | Q92743 | P10636-8 |
| Hyou1 | Q9Y4L1 | P11021 | Igfbp4 | P22692 | P05019 |
| Igfbp6 | P24592 | P24592 | Inhba | P08476 | P21674 |
| Iqgap1 | P46940 | P60709 | Itga5 | P08648 | P02751 |
| Itgb1 | P05556 | P78536 | Itm2b | Q9Y287 | P04578 |
| Kpnb1 | Q14974 | Q99558 | Krt1 | P04264 | P19320 |
| Krt10 | P13645 | P19320 | Lama4 | Q16363 | P04637 |
| Lamc1 | P02468 | P10493 | Lap3 | P28838 | Q13185 |
| Lasp1 | Q14847-2 | Q8TDS5 | Ldha | P00338 | P11142 |
| Lgals1 | P09382 | P35968 | Lgals3 | P16110 | Q9Z0P7 |
| Lgals3bp | Q08380 | Q9BZR8 | Lmna | P02545 | Q14739 |
| Lox | P28300 | Q9UBX5, P15502 | Lrp1 | Q07954 | P02649 |
| Lum | P51884 | P50281 | Mapk1 | P63086 | Q63155 |
| Mapre1 | Q15691 | P11021 | Mdh1 | P40925 | P00533 |
| Mdh2 | P40926 | P19320 | Mif | P14174 | P14174 |
| Mmp2 | P08253 | P16035 | Mrc2 | Q9UBG0 | P02454 |
| Msn | P26038 | P16070 | Mtap | Q9V813 | Q7KNM2 |
| Mtpn | P62775 | Q5XI32 | Myh9 | P35579 | O00255 |
| Myl12a | P19105 | Q14164 | Myl9 | P24844-2 | Q99757 |
| Naca | P38879 | P15731 | Nbl1 | Q61477 | P12023 |
| Ncl | P19338 | Q00987 | Nedd8 | Q15843 | P68104 |
| Nid2 | Q8IV28 | P10745 | Nme1 | P15531 | P10911 |
| Npm1 | P06748 | Q8N726 | Nrp1 | P97333 | P08648 |
| Ntf3 | P20783 | P07174 | Nucb1 | Q02818 | P10823 |
| Ostf1 | Q92882 | P42858 | P4ha2 | O15460 | P07237 |
| P4hb | P07237 | Q6PJG9 | Pabpc1 | P11940 | Q92900 |
| Pafah1b1 | P43034 | P07900 | Pcolce | Q15113 | P18828 |
| Pcsk9 | Q8NBP7 | P08253 | Pdcd5 | O14737 | Q9NRD5 |

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
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| Pdia3 | P30101 | P30304 | Pdia6 | Q15084 | P11021 |
| Pdlim1 | O00151 | P14136 | Pea15 | Q15121 | P28482 |
| Pebp1 | P30086 | P16050 | Pfn1 | P07737 | P60709 |
| Pgam1 | P18669 | P12004 | Pgk1 | P00558, P00558-1 | O15379 |
| Pgm2 | Q96G03 | P04792 | Pkm | P14618-1 | Q16665 |
| Pla1a | EBI-3954042 | P78527 | Pld3 | Q8IV08 | P19838 |
| Plod1 | Q02809 | P55795 | Plod3 | O60568 | Q9UMD9 |
| Ppia | P62937 | O00267 | Ppib | P23284 | P40855 |
| Ppic | P45877 | Q8N9N5 | Ppid | Q08752 | P63244 |
| Ppp2r1a | P30153 | P13569 | Prdx2 | P32119 | P10599 |
| Prdx5 | P30044 | P00441 | Prdx6 | P30041 | Q7KZN9 |
| Prkcsh | P14314 | P04578 | Prnp | P10279, P04156 | P04156 |
| Psma1 | P25786 | P21673 | Psma2 | P25787 | Q9Y5K5 |
| Psma3 | P25788 | Q12846 | Psma4 | P25789 | Q16665 |
| Psma5 | P28066 | Q9Y5K5 | Psma6 | P60900 | Q9Y5K5 |
| Psma7 | O14818 | Q16665 | Psmb1 | P20618 | Q9HAP6 |
| Psmb2 | P49721 | Q9Y5K5 | Psmb3 | P49720 | Q9Y5K5 |
| Psmb4 | P28070 | Q9Y5K5 | Psmb5 | P28074 | Q9Y5K5 |
| Psmb6 | P28072 | Q9Y5K5 | Psmb7 | Q99436 | Q9Y5K5 |
| Psmc2 | P35998 | P38936 | Ptk7 | Q13308 | P35222 |
| Ptpa | P18433 | P12931 | Ptx3 | P26022 | P09038 |
| Rac1 | P63000 | Q13177 | Rack1 | P63244 | Q14694 |
| Rad23b | P54727 | P53350 | Ran | P62826 | P47813 |
| Rcn1 | Q15293 | Q969Y2 | Rcn3 | Q96D15 | Q9UMX1 |
| Rdx | P35241 | P10911 | Rnh1 | P13489 | P03950 |
| Rpl12 | P30050 | P27824 | Rpl19 | P84098 | Q5S007 |
| Rpl23a | P62750 | Q5S007 | Rpl24 | P83731 | Q99558 |
| Rpl30 | P62888 | Q5S007 | Rpl4 | P36578 | Q99558 |
| Rpl5 | P47962 | P23804 | Rpl7a | P62424 | Q99558 |
| Rplp0 | P05388 | P03372 | Rplp1 | P05386 | Q9GZQ8 |
| Rps8 | P62241 | Q15843 | Rpsa | P08865 | P03372 |
| Rsu1 | Q15404 | P48059 | S100a10 | P60903 | P07355 |
| S100a11 | P31949 | P04271 | S100a4 | P26447 | Q00987 |
| S100a6 | P06703 | Q02790 | Sdcbp | O00560 | Q5VTY9 |
| Sdf4 | Q9BRK5 | Q13418 | Sema7a | O75326 | O60486 |
| Septin11 | Q9NVA2 | Q16181 | Serbp1 | Q8NC51 | P67809 |
| Serpinc1 | P01008 | P01008 | Serpine1 | P05121 | Q8NBQ5 |
| Serpinf1 | P36955 | Q9P2X3 | Serping1 | E9PK97 | Q9BRI3 |
| Serpinh1 | P50454 | P03372 | Sh3bgrl | O75368 | P00533 |
| Sod2 | P04179 | P04179 | Sptbn1 | Q01082 | Q13813 |
| Stip1 | P31948 | P53041 | Tars1 | P26639 | P19320 |
| Tf | P02787 | O00501 | Tgm2 | P21980 | P02751 |
| Thbs1 | P07996-PRO_0000035842 | P16671 | Thbs2 | Q03350 | Q07954 |
| Timp1 | P01033 | P14780 | Timp2 | P16035 | P08253 |
| Tkt | Q16832 | P29353 | Tln1 | Q9Y490, P26039 | P05556 |
| Tmpo | P42167 | P27824 | Tmsb10 | P63313 | Q9NUX5 |
| Tmsb4x | P20065 | Q8WWQ8 | Tpi1 | P60174 | P12004 |
| Tpm4 | P67936 | Q9NRD5 | Tpp1 | Q96AP0 | Q92900 |
| Tpt1 | P13693 | P29692 | Tubb4b | P68371 | Q5S007 |

| Input | UniProt Id | Interacts with |
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| Tubb5 | P04350 | P22736 |
| Txn | P10599 | P19883 |
| Uba1 | P22314 | Q9UNE7 |
| Ugp2 | Q16851 | O76003 |
| Vapa | Q9WV55 | Q9QXM1 |
| Vat1 | P54219-3 | Q9Y5Y5 |
| Vcan | P13611 | P14780 |
| Vcp | P55072 | O96017 |
| Vegfd | O43915 | Q15836 |
| Wdr1 | O75083 | P62993 |
| Ybx1 | P67809 | Q9NZI8, Q9Y6M1 |
| Ywhae | P62258 | P30304 |
| Ywhah | Q04917 | P30304 |
| Ywhaz | P63101 | P63017 |

| Input | UniProt Id | Interacts with |
|---|---|---|
| Tubb6 | Q922F4 | Q62108 |
| Txnrd1 | Q16881 | Q03135 |
| Ube2n | P61088 | P98170 |
| Usp14 | P54578 | Q9Y5K5 |
| Vasn | Q6EMK4 | P22735 |
| Vcam1 | P19320 | Q14160 |
| Vcl | Q64727 | Q8VI36 |
| Vegfa | EBI-2895491 | Q16665 |
| Vim | P08670 | P11021 |
| Xpnpep1 | Q9NQW7-3 | P69892 |
| Ywhab | P35213 | Q9JLT6 |
| Ywhag | P61981 | P30304, O14757 |
| Ywhaq | P27348 | P30304 |
| Zyx | Q15942 | P02751 |

| Input | ChEBI Id | Interacts with |
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| Actb | P60709 | 18348 |
| Actn1 | P12814 | 18348 |
| Cand1 | Q86VP6 | 18348 |
| Cdc42 | P60953 | 15996 |
| Cltc | Q00610 | 16618 |
| Ehd1 | Q9H4M9 | 16618 |
| Flnb | O75369 | 18348 |
| Iqgap1 | P46940 | 16618 |
| Kpnb1 | Q14974 | 18348 |
| Lrp1 | Q07954 | 29108 |
| Myh9 | P35579 | 18348 |
| Niban2 | Q96TA1 | 17283 |
| Rab7a | P51149 | 18348 |
| Rack1 | P63244 | 18348 |
| Rdx | P35241 | 16851 |
| Sptbn1 | Q01082 | 16618 |

| Input | ChEBI Id | Interacts with |
|---|---|---|
| Actg1 | P63261 | 18348 |
| Actn4 | O43707 | 16851 |
| Capza1 | P52907 | 18348 |
| Cfl1 | P23528 | 18348 |
| Dstn | P60981 | 16618 |
| Flna | P21333 | 18348 |
| Flnc | Q14315 | 18348 |
| Itgb1 | P05556 | 16618 |
| Ldha | P00338 | 18348 |
| Msn | P26038 | 18348 |
| Neo1 | Q92859 | 28424 |
| Pkm | P14618-1 | 18319 |
| Rac1 | P63000 | 15996 |
| Ran | P62826 | 17552, 15996 |
| S100a13 | P97352 | 29036 |
| Tln1 | Q9Y490 | 18348 |

# 7. Identifiers not found

These 43 identifiers were not found neither mapped to any entity in Reactome.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Aebp1 | Angptl2 | Anxa3 | Ccdc80 | Cd248 | Clic4 | Cpq | Cpxm1 |
| Crip1 | Ctla2a | Dkk3 | Dpp3 | Fkbp10 | Fkbp2 | GaskbB | Glipr2 |
| Hars1 | Lpp | Man1a | Map4 | Metrnl | Mroh6 | Oaf | Olfml3 |
| Palld | Pcdhgc3 | Pdia4 | Postn | Prl2c3 | Prl7c1 | Ptms | Rars1 |
| Rexo2 | Rnase4 | Srpx2 | Svep1 | Tagln | Tgfbr3 | Twf1 | Txndc12 |
| Txnl1 | Uap1l1 | Ufm1 | | | | | |

reactome

# BM-MSC secretome from HFD mice
# Pathway Analysis Report

## Table of Contents

# 1. Introduction

Reactome is a curated database of pathways and reactions in human biology. Reactions can be considered as pathway 'steps'. Reactome defines a 'reaction' as any event in biology that changes the state of a biological molecule. Binding, activation, translocation, degradation and classical biochemical events involving a catalyst are all reactions. Information in the database is authored by expert biologists, entered and maintained by Reactome's team of curators and editorial staff. Reactome content frequently cross-references other resources e.g. NCBI, Ensembl, UniProt, KEGG (Gene and Compound), ChEBI, PubMed and GO. Orthologous reactions inferred from annotation for Homo sapiens are available for 17 non-human species including mouse, rat, chicken, puffer fish, worm, fly, yeast, rice, and Arabidopsis. Pathways are represented by simple diagrams following an SBGN-like format.

Reactome's annotated data describe reactions possible if all annotated proteins and small molecules were present and active simultaneously in a cell. By overlaying an experimental dataset on these annotations, a user can perform a pathway over-representation analysis. By overlaying quantitative expression data or time series, a user can visualize the extent of change in affected pathways and its progression. A binomial test is used to calculate the probability shown for each result, and the p-values are corrected for the multiple testing (Benjamini–Hochberg procedure) that arises from evaluating the submitted list of identifiers against every pathway.

To learn more about our Pathway Analysis, please have a look at our relevant publications:

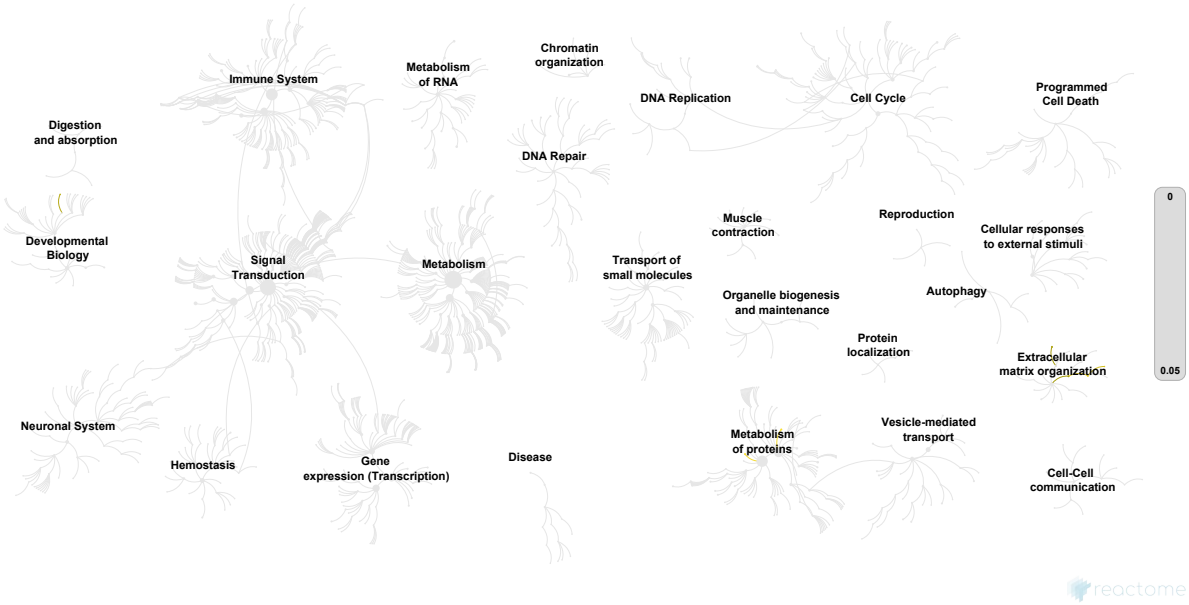
Fabregat A, Sidiropoulos K, Garapati P, Gillespie M, Hausmann K, Haw R, … D'Eustachio P (2016). The reactome pathway knowledgebase. Nucleic Acids Research, 44(D1), D481–D487. https://doi.org/10.1093/nar/gkv1351.

Fabregat A, Sidiropoulos K, Viteri G, Forner O, Marin-Garcia P, Arnau V, … Hermjakob H (2017). Reactome pathway analysis: a high-performance in-memory approach. BMC Bioinformatics, 18.

## 2. Properties

- This is an **overrepresentation** analysis: A statistical (hypergeometric distribution) test that determines whether certain Reactome pathways are over-represented (enriched) in the submitted data. It answers the question 'Does my list contain more proteins for pathway X than would be expected by chance?' This test produces a probability score, which is corrected for false discovery rate using the Benjamani-Hochberg method.
- 380 out of 413 identifiers in the sample were found in Reactome, where 8320 pathways were hit by at least one of them.
- IntAct interactors were included to increase the analysis background. This greatly increases the size of Reactome pathways, which maximises the chances of matching your submitted identifiers to the expanded pathway, but will include interactors that have not undergone manual curation by Reactome and may include interactors that have no biological significance, or unexplained relevance.
- This report is filtered to show only results for species 'Mus musculus' and resource 'all resources'.
- The unique ID for this analysis (token) is MjAyMDAzMjQxMzA3NDhfMzIwNw%3D%3D. This ID is valid for at least 7 days in Reactome's server. Use it to access Reactome services with your data.

# 3. Genome-wide overview




This figure shows a genome-wide overview of the results of your pathway analysis. Reactome pathways are arranged in a hierarchy. The center of each of the circular "bursts" is the root of one top-level pathway, for example "DNA Repair". Each step away from the center represents the next level lower in the pathway hierarchy. The color code denotes over-representation of that pathway in your input dataset. Light grey signifies pathways which are not significantly over-represented.

# 4. Most significant pathways

The following table shows the 25 most relevant pathways sorted by p-value.

| Pathway name | Entities | | | | Reactions | |
|---|---|---|---|---|---|---|
| | found | ratio | p-value | FDR* | found | ratio |
| Regulation of Insulin-like Growth Factor (IGF) transport and uptake by Insulin-like Growth Factor Binding Proteins (IGFBPs) | 41 / 120 | 0.01 | 0.002 | 1 | 5 / 6 | 7.69e-04 |
| Post-translational protein phosphorylation | 39 / 114 | 0.009 | 0.002 | 1 | 1 / 1 | 1.28e-04 |
| Assembly of collagen fibrils and other multimeric structures | 25 / 69 | 0.006 | 0.006 | 1 | 23 / 26 | 0.003 |
| Crosslinking of collagen fibrils | 11 / 25 | 0.002 | 0.017 | 1 | 13 / 13 | 0.002 |
| NCAM1 interactions | 10 / 24 | 0.002 | 0.031 | 1 | 1 / 3 | 3.84e-04 |
| Collagen degradation | 20 / 62 | 0.005 | 0.039 | 1 | 15 / 20 | 0.003 |
| Collagen formation | 31 / 106 | 0.009 | 0.04 | 1 | 55 / 76 | 0.01 |
| Antagonism of Activin by Follistatin | 3 / 4 | 3.31e-04 | 0.052 | 1 | 2 / 2 | 2.56e-04 |
| Activation of C3 and C5 | 4 / 7 | 5.79e-04 | 0.06 | 1 | 3 / 3 | 3.84e-04 |
| Collagen chain trimerization | 14 / 43 | 0.004 | 0.07 | 1 | 10 / 27 | 0.003 |
| Chk1/Chk2(Cds1) mediated inactivation of Cyclin B:Cdk1 complex | 6 / 14 | 0.001 | 0.075 | 1 | 1 / 4 | 5.13e-04 |
| Collagen biosynthesis and modifying enzymes | 22 / 76 | 0.006 | 0.079 | 1 | 32 / 50 | 0.006 |
| HSF1 activation | 5 / 11 | 9.09e-04 | 0.082 | 1 | 5 / 6 | 7.69e-04 |
| Laminin interactions | 10 / 29 | 0.002 | 0.085 | 1 | 6 / 8 | 0.001 |
| ECM proteoglycans | 18 / 57 | 0.005 | 0.092 | 1 | 8 / 15 | 0.002 |
| Dissolution of Fibrin Clot | 6 / 17 | 0.001 | 0.146 | 1 | 17 / 18 | 0.002 |
| Alternative complement activation | 3 / 7 | 5.79e-04 | 0.179 | 1 | 9 / 9 | 0.001 |
| RUNX1 regulates transcription of genes involved in differentiation of keratinocytes | 2 / 4 | 3.31e-04 | 0.202 | 1 | 2 / 2 | 2.56e-04 |
| Trafficking and processing of endosomal TLR | 6 / 19 | 0.002 | 0.206 | 1 | 4 / 6 | 7.69e-04 |
| Elastic fibre formation | 12 / 44 | 0.004 | 0.21 | 1 | 11 / 16 | 0.002 |
| Degradation of the extracellular matrix | 38 / 150 | 0.012 | 0.212 | 1 | 58 / 78 | 0.01 |
| Anchoring fibril formation | 5 / 16 | 0.001 | 0.241 | 1 | 2 / 4 | 5.13e-04 |
| Non-integrin membrane-ECM interactions | 12 / 42 | 0.003 | 0.261 | 1 | 5 / 9 | 0.001 |

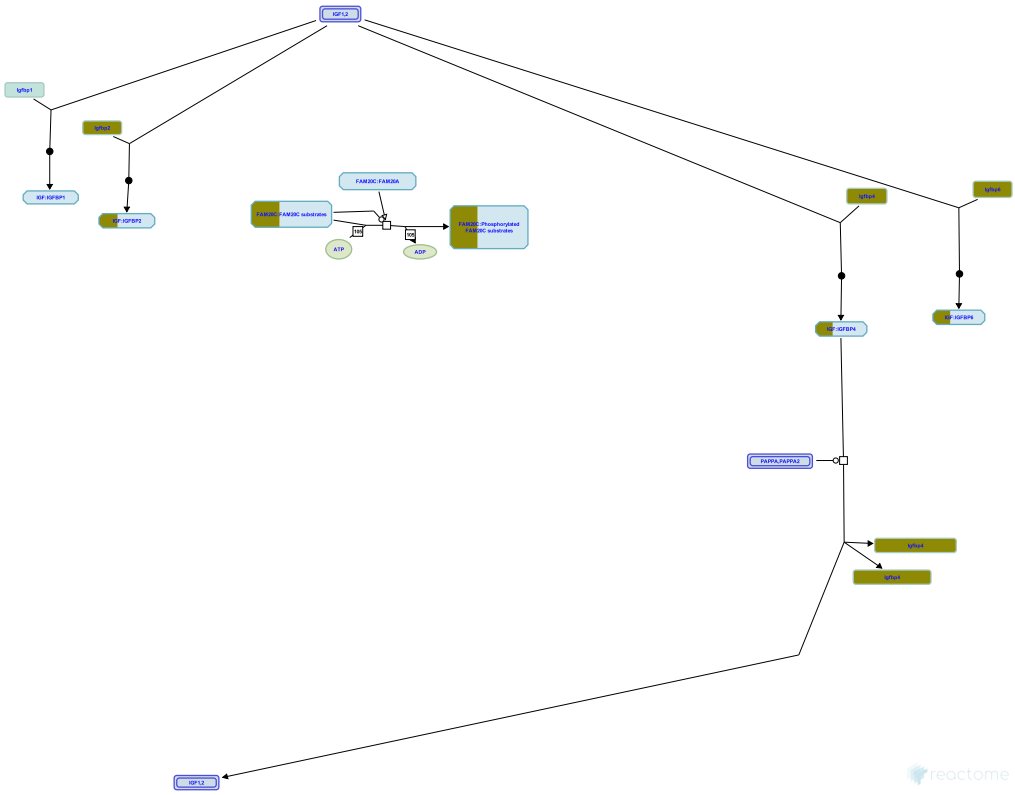
| Pathway name | Entities | | | | Reactions | |
|---|---|---|---|---|---|---|
| | found | ratio | p-value | FDR* | found | ratio |
| Transport of gamma-carboxylated protein precursors from the endoplasmic reticulum to the Golgi apparatus | 3 / 9 | 7.44e-04 | 0.288 | 1 | 3 / 9 | 0.001 |
| Platelet degranulation | 30 / 131 | 0.011 | 0.319 | 1 | 5 / 8 | 0.001 |

* False Discovery Rate

# 5. Pathways details

For every pathway of the most significant pathways, we present its diagram, as well as a short summary, its bibliography and the list of inputs found in it.

## 1. Regulation of Insulin-like Growth Factor (IGF) transport and uptake by Insulin-like Growth Factor Binding Proteins (IGFBPs) (R-MMU-381426)



**Cellular compartments:** extracellular region.

**Inferred from:** Regulation of Insulin-like Growth Factor (IGF) transport and uptake by Insulin-like Growth Factor Binding Proteins (IGFBPs).

This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

More details and caveats of the event inference in Reactome. For details on PANTHER see also: http://www.pantherdb.org/about.jsp

### References

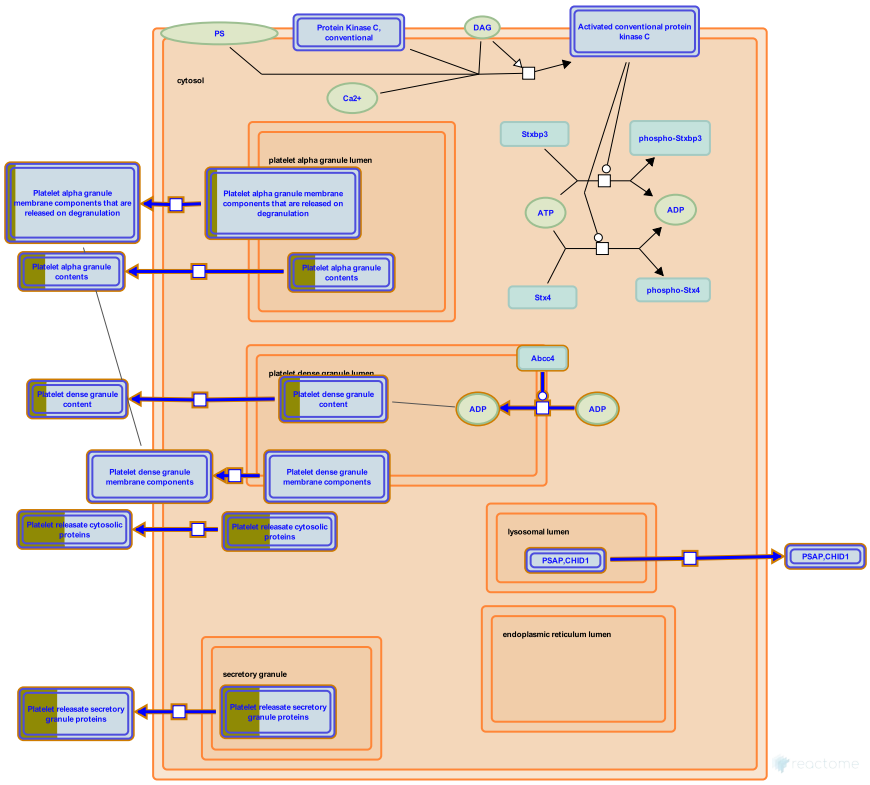
### Edit history

| Date | Action | Author |
|---|---|---|
| 2020-03-08 | Created | Cook J |

## Entities found in this pathway (41)

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| Adam10 | O35598 | Ahsg | P29699 | Alb | P07724 |
| Aplp2 | Q06335 | Apoe | P08226 | C3 | P01027 |
| C4b | P01029 | Calu | O35887 | Ccn1 | P18406 |
| Cdh2 | P15116 | Csf1 | P07141 | Cst3 | P21460 |
| F5 | O88783 | Fbn1 | Q61554 | Fn1 | P11276 |
| Fstl1 | Q62356 | Fstl3 | Q9EQC7 | Gas6 | Q61592 |
| Hsp90b1 | P08113 | Igfbp2 | P47877 | Igfbp3 | P47878 |
| Igfbp4 | P47879 | Igfbp6 | P47880 | Igfbp7 | Q61581 |
| Itih2 | Q61703 | Lamb1 | P02469 | Lamb2 | Q61292 |
| Lamc1 | P02468 | Lgals1 | P16045 | Mfge8 | P21956 |
| Nucb1 | Q02819 | P4hb | P09103 | Pcsk9 | Q80W65 |
| Pdia6 | Q922R8 | Prkcsh | O08795 | Prss23 | Q9D6X6 |
| Rcn1 | Q05186 | Serpinc1 | P32261 | Spp1 | P10923 |
| Tf | Q921I1 | Timp1 | P12032 | | |

## 25. Platelet degranulation (R-MMU-114608)




**Inferred from:** Platelet degranulation .

This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

More details and caveats of the event inference in Reactome. For details on PANTHER see also: http://www.pantherdb.org/about.jsp

### References

### Edit history

| Date | Action | Author |
|---|---|---|
| 2020-03-08 | Created | Cook J |

### Entities found in this pathway (30)

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| A2m | Q6GQT1 | Actg1 | P63260 | Ahsg | P29699 |
| Alb | P07724 | Aldoa | P05064 | Anxa5 | P48036 |
| Aplp2 | Q06335 | Apoh | Q01339 | Ecm1 | Q61508 |
| F5 | O88783 | Fam3c | Q91VU0 | Fn1 | P11276 |
| Gas6 | Q61592 | Islr | Q6GU68 | Lgals3bp | Q07797 |

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| Manf | Q9CXI5 | Pf4 | Q9Z126 | Plg | P20918 |
| Pros1 | Q08761 | Serpine1 | P22777 | Serping1 | P97290 |
| Tagln2 | Q9WVA4 | Tf | Q921I1 | Thbs1 | P35441 |
| Timp1 | P12032 | Tln1 | P26039 | Tmsb4x | P20065 |
| Vcl | Q64727 | Vegfd | P97946 | Wdr1 | O88342 |

# 6. Identifiers found

Below is a list of the input identifiers that have been found or mapped to an equivalent element in Reactome, classified by resource.

### Entities (380)

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| A2m | P01023 | Acta2 | P62737 | Actb | P60709 |
| Actg1 | P63261 | Actr2 | P61160 | Actr3 | F1P679 |
| Adam10 | O14672 | Adam9 | Q13443 | Adamts1 | Q9UHI8 |
| Adamts5 | Q9UNA0 | Adm | F7AC43 | Adss2 | P30520 |
| Ahsg | P02765 | Akr1a1 | P14550 | Akr1b1 | P15121 |
| Alb | P02768 | Aldoa | P04075 | Anxa1 | P07150 |
| Anxa2 | P07355 | Anxa5 | P08758 | Anxa6 | P08133 |
| Aplp2 | Q06481 | Apoe | P02649 | Apoh | P02749 |
| Arg1 | P05089 | Arhgdia | F1PL93 | Arhgdib | P52566 |
| Arpc1b | E2RMT4 | Arpc2 | F1PAG6 | Arpc3 | E2R985 |
| Asah1 | Q13510 | Atox1 | Q9TT99 | Atp5f1b | J9NT37 |
| Atp6ap1 | Q15904 | Atp6ap2 | O75787 | Axl | F1PGV4 |
| B2m | P61769 | B4galt1 | P15291 | Bag3 | Q5U2U8 |
| Bgn | P21810 | Blvrb | P30043 | Bmp1 | P13497 |
| C1qa | E1BSP0 | C1qb | F1NH19 | C1qc | Q02105 |
| C1ra | Q8CG16 | C3 | P01024 | C4b | P01029 |
| Calr | P27797 | Calu | O43852 | Cant1 | Q8WVQ1 |
| Cap1 | Q01518 | Capg | Q9BPX3 | Ccl2 | P13500 |
| Ccl6 | Q68FP3 | Ccl7 | Q03366 | Ccl8 | Q09141 |
| Ccl9 | Q5FVN3 | Ccn1 | O00622 | Ccn2 | P29279 |
| Cd14 | P08571 | Cdh2 | P19022 | Cfh | P06909 |
| Cfl1 | P23528 | Cfp | P27918 | Ckb | P12277 |
| Cmpk1 | P30085 | Cndp2 | Q96KP4 | Cnn2 | Q99439 |
| Col12a1 | Q99715 | Col14a1 | Q05707 | Col1a1 | P02452 |
| Col1a2 | P08123 | Col2a1 | P02458 | Col3a1 | P02461 |
| Col4a1 | P02462 | Col4a2 | P08572 | Col5a1 | P20908 |
| Col5a2 | P05997 | Col5a3 | P25940 | Col6a1 | P12109 |
| Col6a2 | P12110 | Col6a3 | P12111 | Colec12 | Q5KU26 |
| Comp | P49747 | Cotl1 | Q14019 | Cpe | P16870 |
| Creg1 | O75629 | Crlf1 | R4GH98 | Csf1 | P09603 |
| Csf1r | A7Z067 | Csrp1 | P21291 | Cst3 | P01034 |
| Cstb | P04080 | Ctsa | P10619 | Ctsb | P07858 |
| Ctsc | P53634 | Ctsd | P07339 | Ctsh | P09668 |
| Ctsk | P43235 | Ctsl | P07711 | Ctss | P25774 |
| Ctsz | Q9UBR2 | Cxcl1 | P09341 | Cxcl16 | Q8BSU2 |
| Cxcl5 | P50228 | Dag1 | Q14118 | Dbi | P07108 |
| Dcn | P07585 | Dld | P09622 | Dpysl2 | P47942 |
| Ecm1 | Q16610 | Eef1a1 | P68104 | Eef1b | O70251 |
| Eef1g | Q9D8N0 | Eef2 | P13639 | Efemp1 | Q12805 |
| Ehd1 | Q641Z6 | Emilin1 | Q9Y6C2 | Emilin2 | Q9BXX0 |
| Eno1 | P06733 | Ero1a | E2RNW5 | Erp44 | Q9BS26 |

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
|---|---|---|---|---|---|
| Esd | P10768 | Ext2 | Q93063 | Ezr | P15311 |
| F2 | P00734 | F5 | P12259 | Fabp5 | Q01469 |
| Fam3c | Q92520 | Fbln1 | P23142 | Fbln2 | P98095 |
| Fbln5 | Q9UBX5 | Fbn1 | P35555 | Fkbp1a | P62942 |
| Flnb | A0A0G2JXT8 | Flnc | E2RP26 | Fmod | Q06828 |
| Fn1 | P02751 | Fscn1 | Q16658 | Fst | P47931 |
| Fstl1 | Q12841 | Fstl3 | O95633 | Fth1 | P02794 |
| Ftl1 | P02793 | Galnt2 | Q10471 | Gapdh | P04406 |
| Gas6 | Q14393 | Gdi2 | P50395 | Gm20390 | E9PZF0 |
| Gm20547 | B8JJN0 | Gm2a | P17900 | Got1 | P17174 |
| Got2 | P00505 | Gpc1 | P35052 | Gpi | P06744 |
| Grn | P28799 | Gsn | P06396 | Gsr | P00390-2 |
| Gstp1 | P09211 | Gusb | P08236 | Gzme | P08884 |
| H4c1 | P62805 | H4c11 | P62805 | H4c12 | P62805 |
| H4c14 | P62805 | H4c2 | P62805 | H4c3 | P62805 |
| H4c4 | P62805 | H4c6 | P62805 | H4c8 | P62805 |
| H4c9 | P62805 | H4f16 | P62804 | Hexb | P07686 |
| Hist1h4m | P62804 | Hmox1 | P09601 | Hnrnpa1 | F6XNZ3 |
| Hnrnpa2b1 | P22626 | Hnrnpu | Q6IMY8 | Hp | P00738 |
| Hprt1 | P00492 | Hsp90aa1 | P07900 | Hsp90ab1 | P08238 |
| Hsp90b1 | P14625 | Hspa4 | O88600 | Hspa5 | P11021 |
| Hspa8 | P11142 | Hspd1 | P63038 | Hspg2 | P98160 |
| Htra1 | Q92743 | Icam1 | P13597 | Idh1 | O75874 |
| Igfbp2 | P47877 | Igfbp3 | P17936 | Igfbp4 | P22692 |
| Igfbp6 | P47880 | Igfbp7 | Q16270 | Inhba | Q04998 |
| Iqgap1 | P46940 | Islr | O14498 | Itgb2 | P05107 |
| Itih2 | P19823 | Itm2b | Q9Y287 | Kpnb1 | Q14974 |
| Krt1 | P04264 | Krt2 | P35908 | Krt5 | F1SGG6 |
| Krt76 | Q01546 | Krt77 | Q7Z794 | Krt78 | Q8N1N4 |
| Krt79 | Q5XKE5 | Lama2 | P24043 | Lama4 | Q16363 |
| Lamb1 | P07942 | Lamb2 | P11047, P55268 | Lamc1 | P11047 |
| Lcp1 | P13796 | Ldha | P00340 | Ldhb | P00337 |
| Lgals1 | P09382 | Lgals3 | P17931 | Lgals3bp | Q08380 |
| Lgmn | Q9R0J8 | Lipa | Q9Z0M5 | Lmna | P48678-3 |
| Lox | P28300 | Loxl1 | Q08397 | Loxl2 | Q9Y4K0 |
| Loxl3 | P58215 | Lpl | P11151 | Lrp1 | E1BGJ0 |
| Lta4h | P09960 | Ltbp2 | Q14767 | Lum | P51884 |
| Lyz2 | P08905 | Man2a1 | Q16706 | Man2b1 | O00754 |
| Manf | P55145 | Marcks | A0A287BRL8 | Mdh1 | P40925 |
| Mdh2 | P40926 | Mfap5 | Q13361 | Mfge8 | Q08431 |
| Mif | P14174 | Minpp1 | Q9UNW1 | Mmp12 | P39900 |
| Mmp19 | Q99542 | Mmp2 | P08253 | Mmp3 | P08254 |
| Mrc1 | P22897 | Mrc2 | Q9UBG0 | Msn | Q9W002 |
| Mt2 | P02798 | Mtap | Q13126 | Mydgf | Q969H8 |
| Myh9 | F1MQ37 | Myl12a | Q6ZWQ9 | Naglu | P54802 |
| Ncl | P09405 | Nedd8 | Q71UE8 | Nid1 | P14543 |
| Nid2 | Q14112 | Nme1 | P15531 | Npc2 | P61916 |
| Npm1 | P13084 | Nrp1 | A4III3 | Nucb1 | Q02818 |
| Ogn | P20774 | P4hb | P07237 | Pafah1b2 | P68402 |

| Input | UniProt Id | Input | UniProt Id | Input | UniProt Id |
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| Pcolce | Q15113 | Pcsk9 | Q8NBP7 | Pdcd6ip | Q8WUM4 |
| Pdia3 | F6WRR4 | Pdia6 | Q15084 | Pebp1 | P30086 |
| Pf4 | P02776 | Pfn1 | P07737 | Pgam1 | P18669 |
| Pgd | P52209 | Pgk1 | P00558 | Pgls | O95336 |
| Pgm1 | P36871 | Pkm | P14618 | Pla2g7 | Q5RHM0 |
| Plau | P00749 | Pld3 | Q9VIF2 | Plg | P00747 |
| Plod1 | Q02809 | Plod2 | O00469 | Plod3 | O60568 |
| Ppia | P62937 | Ppib | P23284 | Prdx2 | Q61171 |
| Prdx6 | P30041 | Prkcsh | P14314 | Prnp | P04156 |
| Pros1 | P07225 | Prss23 | O95084 | Psma1 | P25786 |
| Psma2 | P25787 | Psma3 | P25788 | Psma4 | P25789 |
| Psma5 | P28066 | Psma6 | P60900 | Psma7 | O14818 |
| Psmb2 | P49721 | Psmb3 | P49720 | Psmb6 | P28072 |
| Ptx3 | P26022 | Pvr | Q5U334 | Pxdn | Q92626 |
| Qpct | Q16769 | Rcn1 | Q15293 | Rdx | P35241 |
| Rnaset2b | C0HKG6 | Rpl12 | P30050 | Rpl4 | P36578 |
| Rplp1 | P05386 | Rplp2 | P05387 | Rps12 | P25398 |
| Rps14 | P62263 | Rps28 | P62857 | Rps8 | P62241 |
| Rsu1 | E2R9R1 | S100a11 | P31949 | Saa3 | Q2HXZ9 |
| Sat2 | Q96QD8 | Sdcbp | O00560 | Sema7a | F1NIZ9 |
| Serpinb2 | P29524 | Serpinb6a | Q6P9U0 | Serpinc1 | P01008 |
| Serpine1 | P05121 | Serpine2 | P07092 | Serping1 | P05155 |
| Serpinh1 | P50454 | Slit3 | F1RR92 | Sod2 | P09671 |
| Sod3 | O09164 | Spon2 | Q9BUD6 | Spp1 | P10451 |
| Sptbn1 | Q62261 | Ssc5d | A1L4H1 | Stip1 | P31948 |
| Tagln2 | P37802 | Taldo1 | P37837 | Tcn2 | P20062 |
| Tf | P02787 | Tgfbi | Q15582 | Thbs1 | P07996 |
| Thbs2 | P35442 | Timp1 | P01033 | Timp2 | P16035 |
| Tkt | P29401 | Tln1 | Q9Y490 | Tmsb4x | P62328 |
| Tpi1 | P60174 | Tpm4 | Q6IRU2 | Tpp1 | Q96AP0 |
| Tubb5 | P07437 | Txn | P08629 | Txnrd1 | Q16881 |
| Ube2l3 | F6W7B6 | Ube2n | P61088 | Vat1 | Q99536 |
| Vcam1 | P29533 | Vcl | P18206 | Vcp | P55072 |
| Vegfd | O43915 | Vim | P02543 | Wdr1 | O75083 |
| Xdh | F1S3Y7 | Ybx1 | P62960 | Ywhab | Q5XGC8 |
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| Input | Ensembl Id | Input | Ensembl Id | Input | Ensembl Id |
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| Acta2 | ENSG00000107796 | Actb | ENST00000331789 | Anxa1 | ENSG00000135046 |
| Anxa2 | ENSG00000182718 | Apoe | ENSG00000130203 | Atp5f1b | ENSG00000110955 |
| B2m | ENSG00000166710 | C1qc | ENSGALP00000007599 | Calr | ENSG00000179218 |
| Ccl2 | ENSG00000108691 | Ccn1 | ENSG00000145386 | Ccn2 | ENSG00000118523 |
| Cfl1 | ENSG00000172757 | Cnn2 | ENSG00000064666 | Col1a1 | ENSG00000108821 |
| Col1a2 | ENSG00000164692 | Csf1 | ENSG00000184371 | Csf1r | ENSG00000182578 |
| Csrp1 | ENSG00000159176 | Ctsd | ENSG00000117984 | Cxcl1 | ENSG00000163739 |
| Fn1 | ENSG00000115414 | Fscn1 | ENSG00000075618 | Fth1 | ENST00000273550 |
| Hmox1 | ENSG00000100292 | Hnrnpa2b1 | ENSG00000122566 | Hsp90aa1 | ENSG00000080824 |
| Hsp90b1 | ENSG00000166598 | Hspa5 | ENSG00000044574 | Hspa8 | ENSG00000109971 |

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
|---|---|---|---|---|---|
| Ecm1 | Q16610 | Q9NQ94 | Eef1a1 | P68105 | Q06124 |
| Eef1b | P24534 | P26641 | Eef1g | P26641, P26641-2 | P29692, P24534 |
| Eef2 | P13639 | Q16539 | Efemp1 | Q12805 | P24592 |
| Ehd1 | Q9H4M9 | Q9H1K0 | Emilin1 | Q9Y6C2-2, Q9Y6C2 | Q00994 |
| Eno1 | P06733 | P03496 | Ero1a | Q96HE7 | P07237 |
| Erp29 | P30040 | Q969S0 | Ezr | P15311, P31977 | Q63155 |
| Fam3c | Q92520 | Q15223 | Fbln1 | P23142 | P02647 |
| Fbln2 | P98095 | Q9H2F3 | Fbln5 | Q9UBX5 | P15502 |
| Fbn1 | P35555 | P15502 | Fkbp1a | P62942 | P36896 |
| Flnb | O75369 | Q13233 | Flnc | Q14315 | O75923 |
| Fmod | P13605 | P08603 | Fn1 | P02751 | P07585 |
| Fscn1 | Q16658 | P54278 | Fst | P19883 | P10599 |
| Fstl1 | Q12841 | P08571 | Fth1 | P02794 | P04792 |
| Galnt2 | Q10471 | Q9HC36 | Gapdh | P04406 | P00558 |
| Gdi2 | P50395 | Q8BMD2 | Got1 | P17174 | P00533 |
| Grn | P28799 | P98160 | Gsn | P06396 | P32121, P49407 |
| Gstp1 | P09211 | P22735 | H4c1 | P62805 | P33992, P25205, P49736 |
| H4c11 | P62805 | P33992, P25205, P49736 | H4c12 | P62805 | P33992, P25205, P49736 |
| H4c14 | P62805 | P33992, P25205, P49736 | H4c2 | P62805 | P33992, P25205, P49736 |
| H4c3 | P62805 | P33992, P25205, P49736 | H4c4 | P62805 | P33992, P25205, P49736 |
| H4c6 | P62805 | P33992, P25205, P49736 | H4c8 | P62805 | P33992, P25205, P49736 |
| H4c9 | P62805 | P33992, P25205, P49736 | Hexb | P07686 | P06865 |
| Hmox1 | P09601 | Q9NUX5 | Hnrnpa1 | P09651 | P22626 |
| Hnrnpa2b1 | P22626 | P67809 | Hnrnpab | Q7ZYE9 | P26599 |
| Hnrnpu | Q00839 | Q9NZI8 | Hp | P00738 | P02647 |
| Hprt1 | P00492 | Q96G04 | Hsp90aa1 | P07900 | P12931 |
| Hsp90ab1 | P08238 | O14757 | Hsp90b1 | P14625 | P11021 |
| Hspa4 | P34932 | P11142 | Hspa5 | P11021 | P13569 |
| Hspa8 | P11142 | Q99558 | Hspd1 | P10809 | Q16822 |
| Hspe1 | P61604 | P19320 | Hspg2 | P98160-PRO_0000391621, P98160-PRO_0000391622, P98160 | P35968 |
| Htra1 | Q92743 | P10636-8 | Icam1 | EBI-6726290, EBI-10052614 | Q04206 |
| Igfbp3 | P17936 | Q86XT9 | Igfbp4 | P22692 | P05019 |
| Igfbp6 | P24592 | P24592 | Inhba | P08476 | P21674 |
| Iqgap1 | B5DFH1 | Q5M824 | Itgb2 | P05107 | P00519 |
| Itm2b | Q9Y287 | P04578 | Kpnb1 | Q14974 | Q9H1C4 |
| Krt1 | P04264 | P19320 | Krt76 | Q01546 | O43559 |
| Krt79 | Q5XKE5 | A1L190 | Lama4 | Q16363 | P04637 |
| Lamc1 | P02468 | P10493 | Ldha | P00338 | P11142 |
| Ldhb | P07195 | P19320 | Lgals1 | P09382 | P35968 |
| Lgals3 | P17931 | P09237 | Lgals3bp | Q08380 | Q9BZR8 |
| Lmna | P48678 | P31750 | Lox | P28300 | Q9UBX5, P15502 |
| Lrp1 | Q07954 | P02649 | Lum | P51884 | P50281 |
| Mdh1 | P40925 | P00533 | Mdh2 | P40926 | P19320 |
| Mif | P14174 | P14174 | Mmp2 | P08253 | P16035 |
| Mrc1 | P25588 | P32485 | Mrc2 | Q9UBG0 | P02454 |

| Input | UniProt Id | Interacts with | Input | UniProt Id | Interacts with |
|---|---|---|---|---|---|
| Msn | P26038 | P16070 | Mtap | Q9V813 | Q7KNM2 |
| Myh9 | P35579 | O00255 | Myl12a | P19105 | Q14164 |
| Naca | P38879 | P15731 | Nap1l1 | P55209 | P52333 |
| Ncl | P19338 | P35579 | Nedd8 | Q15843 | Q8TBC4, P61081 |
| Nid2 | Q8IV28 | P10745 | Nme1 | P15531 | P10911 |
| Npc2 | P61916 | 16113, O15118 | Npm1 | P06748 | Q8N726 |
| Nrp1 | P97333 | P08648 | Nucb1 | Q02818 | P10823 |
| P4hb | P07237 | P01137 | Pafah1b2 | P68402 | P43034 |
| Pcolce | Q15113 | P18828 | Pcsk9 | Q8NBP7 | P08253 |
| Pdcd6ip | Q8WUM4 | P12931 | Pdia3 | P30101 | P30304 |
| Pdia6 | Q15084 | P11021 | Pdlim1 | O00151 | P14136 |
| Pebp1 | P30086 | P16050 | Pf4 | P02776-PRO_0000351217, P02776 | P78556, P13501, O15444, Q99616, P48061 |
| Pfn1 | P07737 | O08816 | Pgam1 | P18669 | P12004 |
| Pgk1 | P00558, P00558-1 | O15379 | Pkm | P14618-1 | Q16665 |
| Pld3 | Q8IV08 | P19838 | Plod1 | Q02809 | P55795 |
| Plod3 | O60568 | Q9UMD9 | Pls3 | Q9NRY6 | P49639 |
| Ppia | P62937 | O00267 | Ppib | P23284 | P40855 |
| Ppic | P45877 | Q8N9N5 | Prdx2 | P32119 | P10599 |
| Prdx6 | P30041 | Q7KZN9 | Prkcsh | P14314 | P04578 |
| Prnp | P10279, P04156 | P04156 | Psma1 | P25786 | P21673 |
| Psma2 | P25787 | Q9Y5K5 | Psma3 | P25788 | Q12846 |
| Psma4 | P25789 | Q16665 | Psma5 | P28066 | Q9Y5K5 |
| Psma6 | P60900 | Q9Y5K5 | Psma7 | O14818 | Q16665 |
| Psmb2 | P49721 | Q9Y5K5 | Psmb3 | P49720 | Q9Y5K5 |
| Psmb6 | P28072 | Q9Y5K5 | Ptx3 | P26022 | P09038 |
| Pvr | P15151 | P11686 | Rcn1 | Q15293 | Q969Y2 |
| Rcn3 | Q96D15 | Q9UMX1 | Rdx | P35241 | P10911 |
| Rnh1 | P13489 | P03950 | Rpl12 | P30050 | P27824 |
| Rpl4 | P36578 | Q99558 | Rplp1 | P05386 | Q9GZQ8 |
| Rps12 | P25398 | P03372 | Rps14 | P62263 | Q9Y3D8 |
| Rps8 | P62241 | Q15843 | Rsu1 | Q15404 | Q13418 |
| S100a11 | P31949 | P04271 | S100a4 | P26447 | P35579 |
| S100a6 | P06703 | Q02790 | Sat2 | Q96F10 | P21673 |
| Sdcbp | O00560 | P24592 | Sdf4 | Q9BRK5 | Q13418 |
| Sema7a | O75326 | O60486 | Serbp1 | Q8NC51 | P67809 |
| Serpinc1 | P01008 | P01008 | Serpine1 | P05121 | Q8NBQ5 |
| Serpinf1 | P36955 | Q9P2X3 | Serping1 | E9PK97 | Q9BRI3 |
| Serpinh1 | P50454 | P03372 | Sod2 | P04179 | P04179 |
| Spp1 | P10451 | P16070 | Sptbn1 | Q01082 | Q13813 |
| Ssc5d | A1L4H1 | Q13526 | Stip1 | P31948 | P19320 |
| Tf | P02787 | O00501 | Thbs1 | P07996-PRO_0000035842 | P16671 |
| Thbs2 | Q03350 | Q07954 | Timp1 | P01033 | P14780 |
| Timp2 | P16035 | P08253 | Tinagl1 | Q9GZM7 | O95429 |
| Tkt | Q16832 | P29353 | Tln1 | Q9Y490 | P19320, 18348 |
| Tmsb10 | P63313 | Q9NUX5 | Tmsb4x | P20065 | Q8WWQ8 |
| Tpi1 | P60174 | P12004 | Tpm4 | P67936 | Q9NRD5 |
| Tpp1 | Q96AP0 | O43768 | Tpt1 | P13693 | P29692 |
| Tubb5 | P04350 | P22736 | Txn | P10599 | P19883 |

| Input | UniProt Id | Interacts with |
|---|---|---|
| Txnrd1 | Q16881 | Q03135 |
| Ube2n | P61088 | P98170 |
| Vat1 | P54219-3 | Q9Y5Y5 |
| Vcl | Q64727, P12003 | P26039 |
| Vegfd | O43915 | Q15836 |
| Wdr1 | O75083 | P62993 |
| Ywhab | P35213 | Q9JLT6 |
| Ywhag | P61981 | Q92934 |
| Ywhaq | P27348 | Q92934 |

| Input | UniProt Id | Interacts with |
|---|---|---|
| Ube2l3 | P68036 | P50876 |
| Vasn | Q6EMK4 | P22735 |
| Vcam1 | P19320 | P06733 |
| Vcp | P55072 | O96017 |
| Vim | P08670 | P11021 |
| Ybx1 | P67809 | Q99697 |
| Ywhae | P62258 | Q92934 |
| Ywhah | Q04917 | Q92934 |
| Ywhaz | P63104 | Q92934 |

| Input | ChEBI Id | Interacts with |
|---|---|---|
| Actb | P60709 | 18348 |
| Cfh | P08603 | 18132 |
| Dstn | P60981 | 16618 |
| Ezr | P15311 | 18348 |
| Flnc | Q14315 | 18348 |
| Iqgap1 | P46940 | 16618 |
| Ldha | P00338 | 18348 |
| Msn | P26038 | 18348 |
| Niban2 | Q96TA1 | 17283 |
| Pkm | P14618-1 | 18319 |
| Sptbn1 | Q01082 | 16618 |

| Input | ChEBI Id | Interacts with |
|---|---|---|
| Actg1 | P63261 | 18348 |
| Cfl1 | P23528 | 18348 |
| Ehd1 | Q9H4M9 | 16618 |
| Flnb | O75369 | 18348 |
| Igfbp3 | P17936 | 16336 |
| Kpnb1 | Q14974 | 18348 |
| Lrp1 | Q07954 | 29108 |
| Myh9 | P35579 | 18348 |
| Npc2 | P61916 | 16113 |
| Rdx | P35241 | 16851 |
| Tln1 | Q9Y490 | 18348 |

# 7. Identifiers not found

These 33 identifiers were not found neither mapped to any entity in Reactome.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Adck5 | Aebp1 | Angptl2 | Anxa3 | C1s1 | Ccdc80 | Cd248 | Cpxm1 |
| Ctla2a | Dkk3 | Fkbp10 | Fndc1 | GaskbB | Hars1 | Hint1 | Man1a |
| Metrnl | Mroh6 | Oaf | Olfml2b | Pdgfrl | Pdia4 | Prl7c1 | Ptms |
| Rars1 | Rnase4 | Rps18-ps6 | Sbsn | Srpx | Srpx2 | Svep1 | Tagln |
| Tgfbr3 | | | | | | | |