

Introduction

Reactome is open-source, open access, manually curated and peer-reviewed pathway database. Pathway annotations are authored by expert biologists, in collaboration with Reactome editorial staff and cross-referenced to many bioinformatics databases. A system of evidence tracking ensures that all assertions are backed up by the primary literature. Reactome is used by clinicians, geneticists, genomics researchers, and molecular biologists to interpret the results of high-throughput experimental studies, by bioinformaticians seeking to develop novel algorithms for mining knowledge from genomic studies, and by systems biologists building predictive models of normal and disease variant pathways.

The development of Reactome is supported by grants from the US National Institutes of Health (P41 HG003751), University of Toronto (CFREF Medicine by Design), European Union (EU STRP, EMI-CD), and the European Molecular Biology Laboratory (EBI Industry program).

Literature references

- Fabregat, A., Sidiropoulos, K., Viteri, G., Forner, O., Marin-Garcia, P., Arnau, V. et al. (2017). Reactome pathway analysis: a high-performance in-memory approach. *BMC bioinformatics*, 18, 142. [↗](#)
- Sidiropoulos, K., Viteri, G., Sevilla, C., Jupe, S., Webber, M., Orlic-Milacic, M. et al. (2017). Reactome enhanced pathway visualization. *Bioinformatics*, 33, 3461-3467. [↗](#)
- Fabregat, A., Jupe, S., Matthews, L., Sidiropoulos, K., Gillespie, M., Garapati, P. et al. (2018). The Reactome Pathway Knowledgebase. *Nucleic Acids Res*, 46, D649-D655. [↗](#)
- Fabregat, A., Korninger, F., Viteri, G., Sidiropoulos, K., Marin-Garcia, P., Ping, P. et al. (2018). Reactome graph database: Efficient access to complex pathway data. *PLoS computational biology*, 14, e1005968. [↗](#)

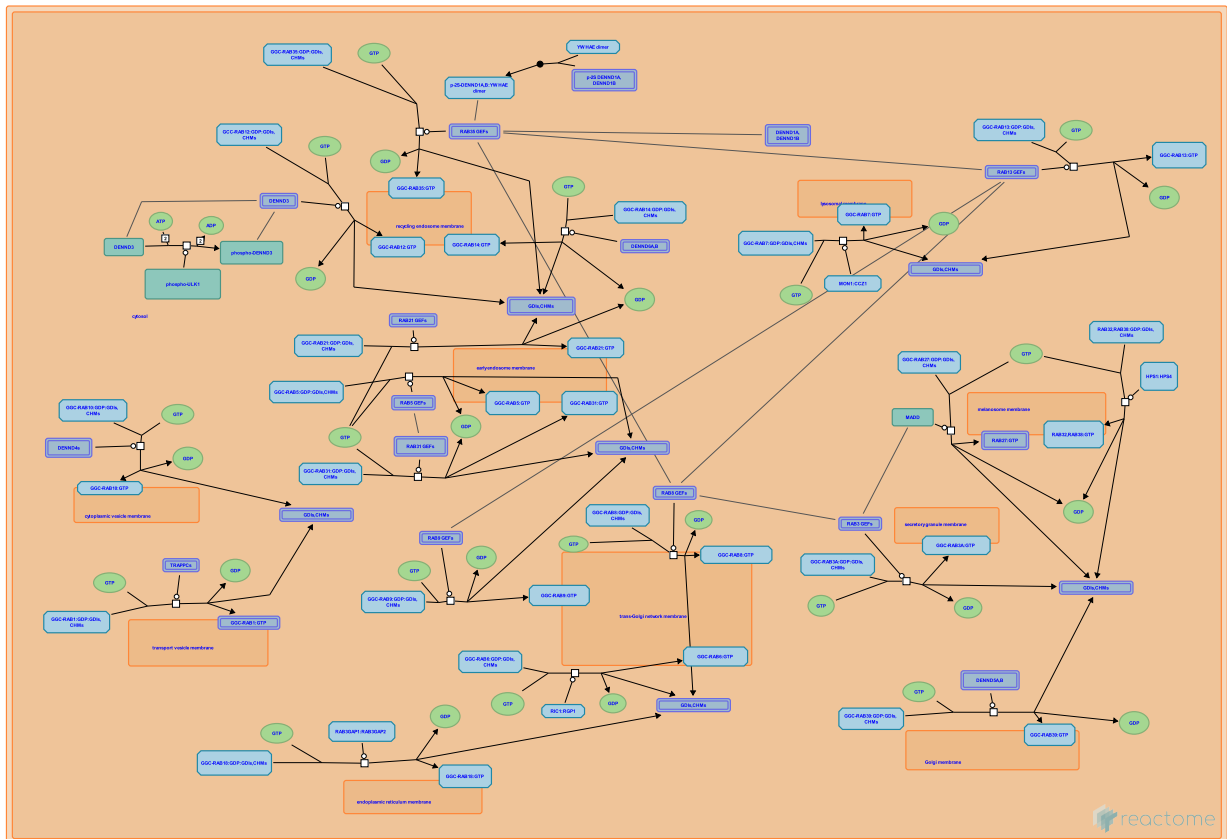
Reactome database release: 88

This document contains 1 pathway and 20 reactions ([see Table of Contents](#))

RAB GEFs exchange GTP for GDP on RABs ↗

Stable identifier: R-BTA-8876198

Inferred from: RAB GEFs exchange GTP for GDP on RABs (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

RAB3 GEFs exchange GTP for GDP on RAB3A ↗

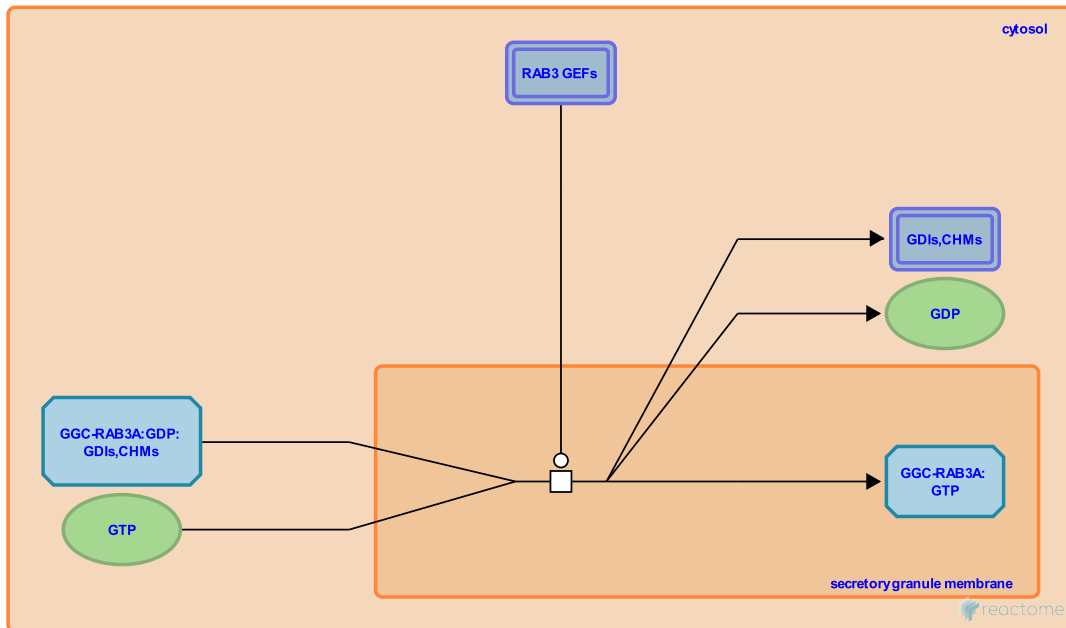
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8875318

Type: transition

Compartments: secretory granule membrane, cytosol

Inferred from: RAB3 GEFs exchange GTP for GDP on RAB3A (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

RAB5 GEFs exchange GTP for GDP on RAB5 ↗

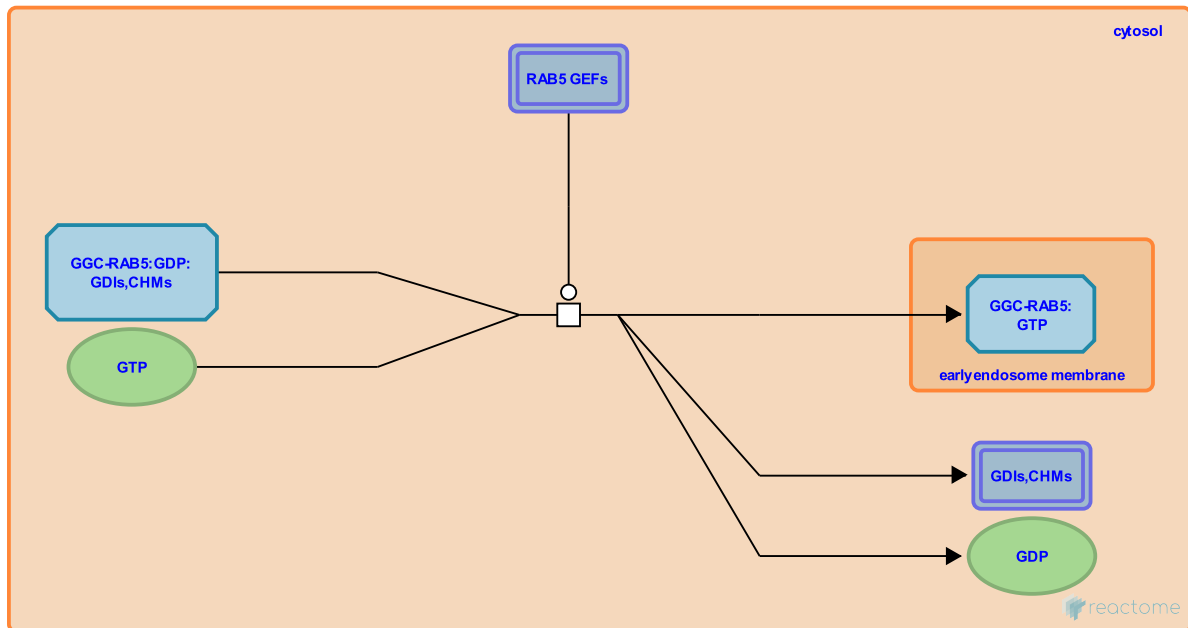
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8875320

Type: transition

Compartments: cytosol, early endosome membrane

Inferred from: RAB5 GEFs exchange GTP for GDP on RAB5 (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

RIC1-RGP1 exchanges GTP for GDP on RAB6 ↗

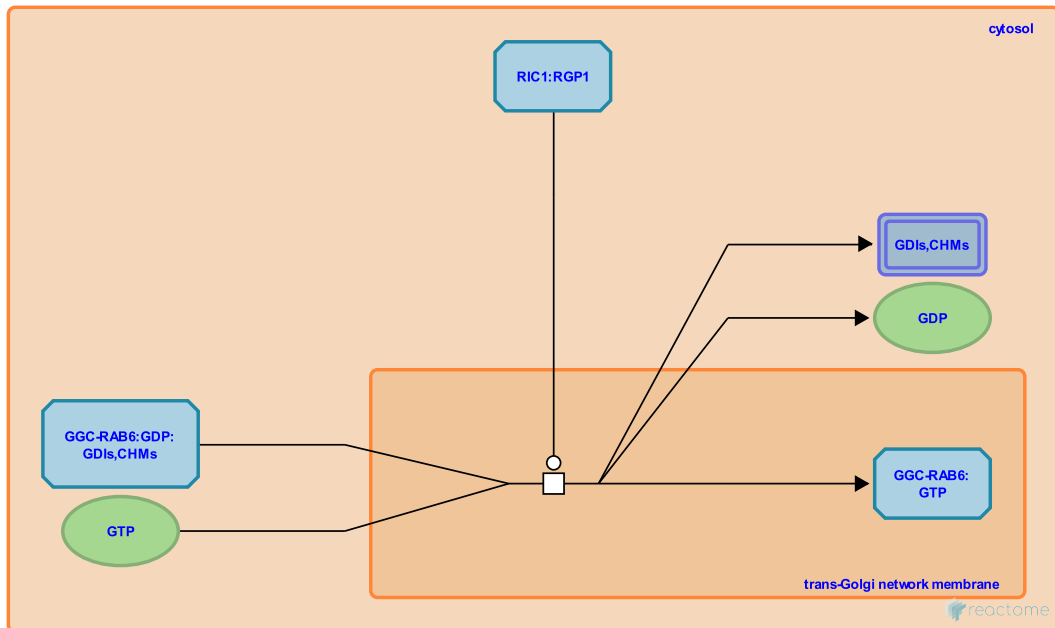
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8876193

Type: transition

Compartments: trans-Golgi network membrane, cytosol

Inferred from: [RIC1-RGP1 exchanges GTP for GDP on RAB6 \(Homo sapiens\)](#)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

MON1:CCZ1 exchanges GTP for GDP on RAB7 ↗

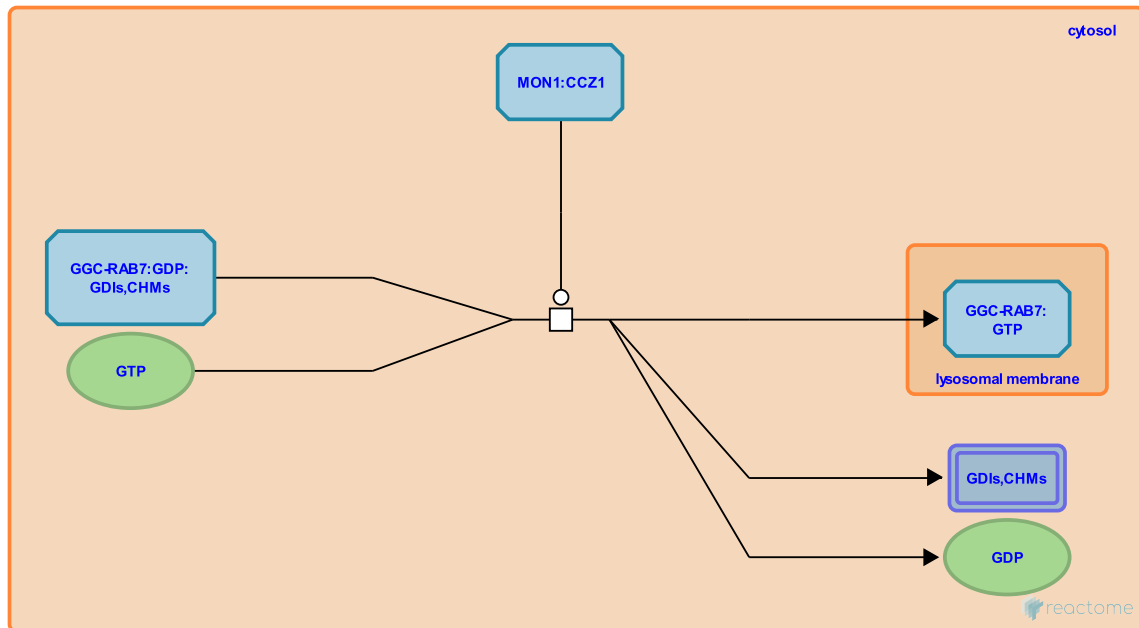
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8877451

Type: transition

Compartments: cytosol, lysosomal membrane

Inferred from: [MON1:CCZ1 exchanges GTP for GDP on RAB7 \(Homo sapiens\)](#)



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>

RAB8 GEFs exchange GTP for GDP on RAB8 ↗

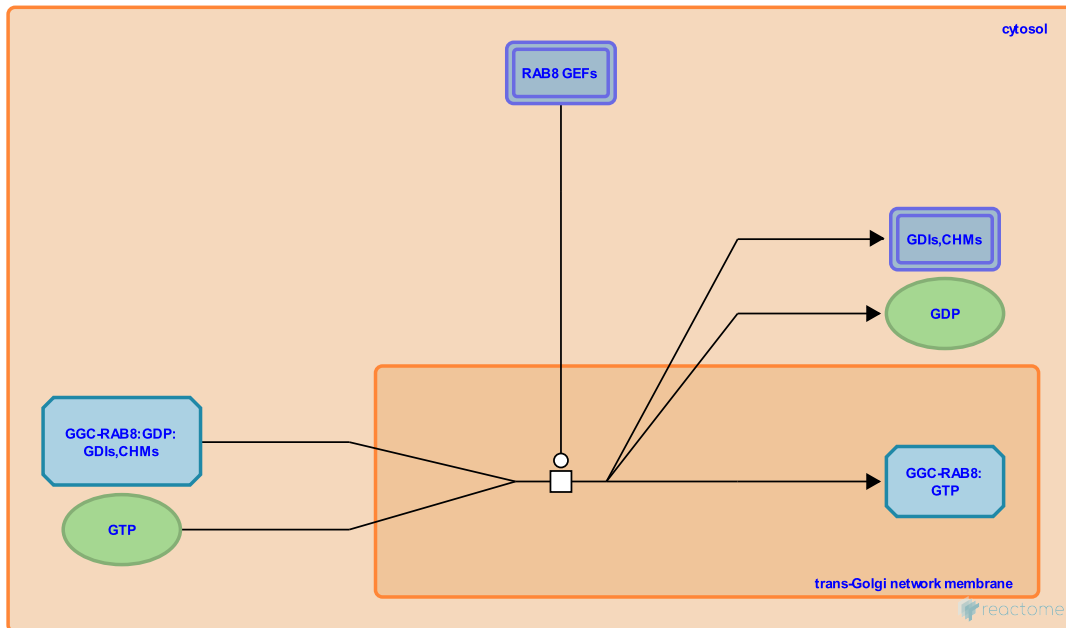
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8876190

Type: transition

Compartments: trans-Golgi network membrane, cytosol

Inferred from: RAB8 GEFs exchange GTP for GDP on RAB8 (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

RAB9 GEFs exchange GTP for GDP on RAB9 ↗

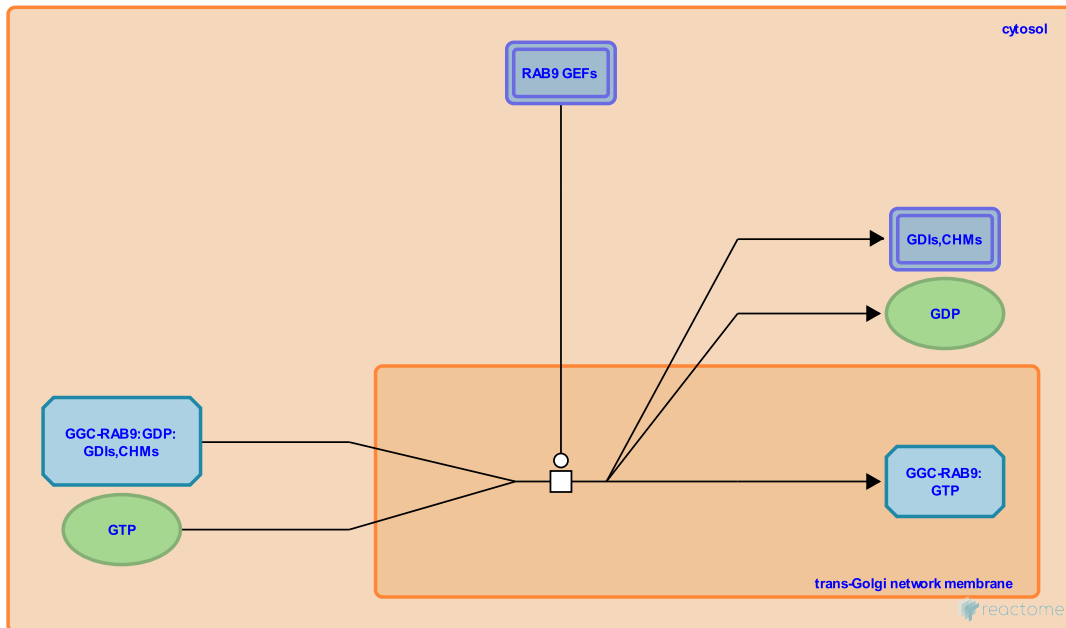
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8876191

Type: transition

Compartments: trans-Golgi network membrane, cytosol

Inferred from: RAB9 GEFs exchange GTP for GDP on RAB9 (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

DENND4s exchange GTP for GDP on RAB10 ↗

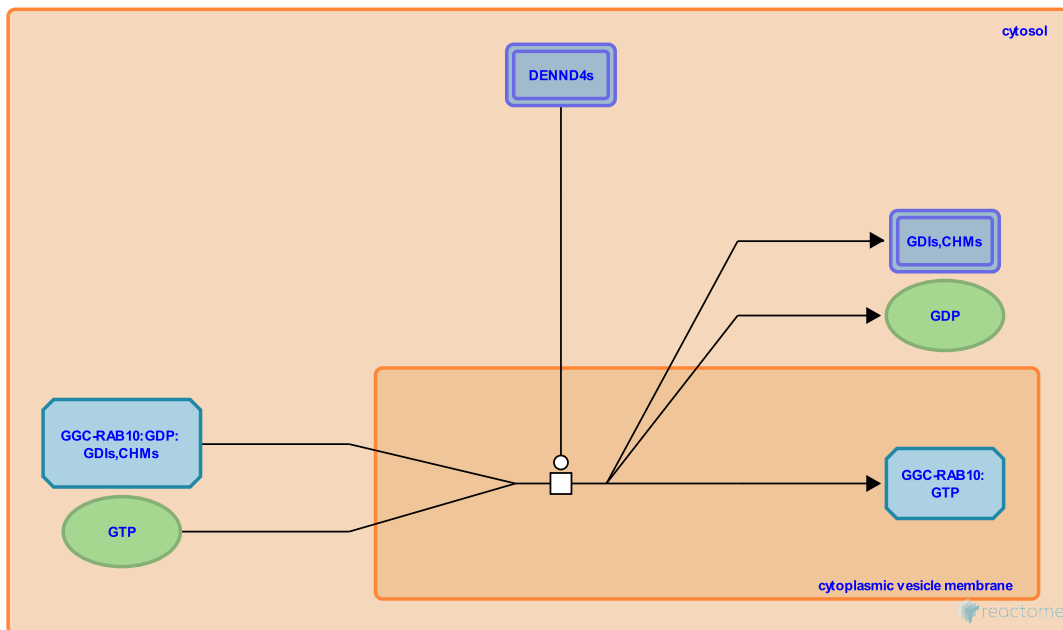
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8876188

Type: transition

Compartments: cytoplasmic vesicle membrane, cytosol

Inferred from: DENND4s exchange GTP for GDP on RAB10 (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

p-ULK1 phosphorylates DENND3 ↗

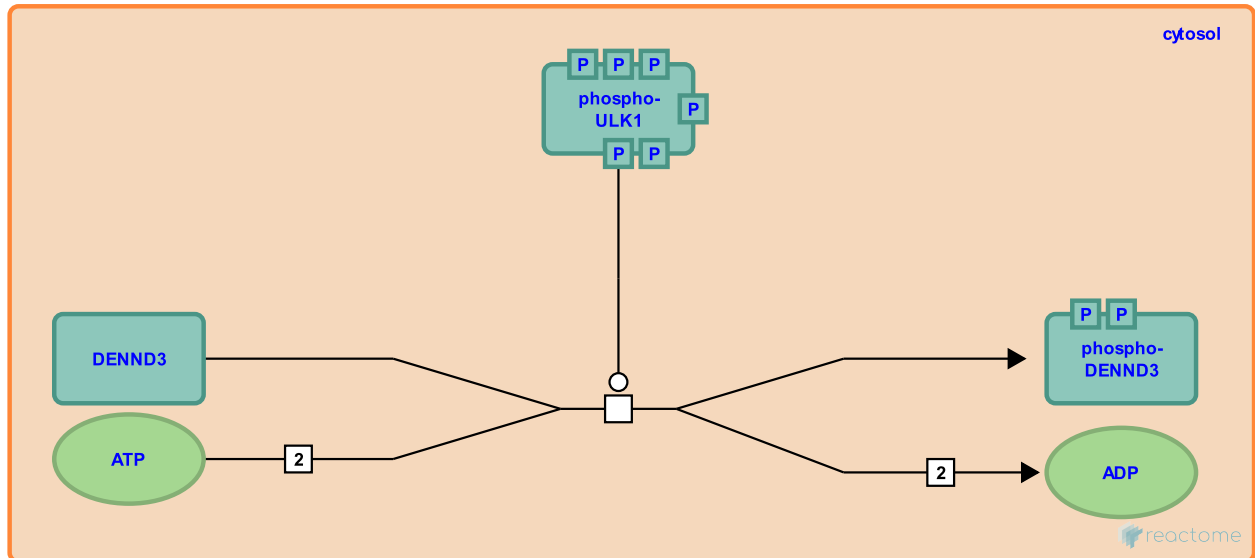
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8876446

Type: transition

Compartments: cytosol

Inferred from: p-ULK1 phosphorylates DENND3 (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Followed by: DENND3 exchanges GTP for GDP on RAB12

DENND3 exchanges GTP for GDP on RAB12 ↗

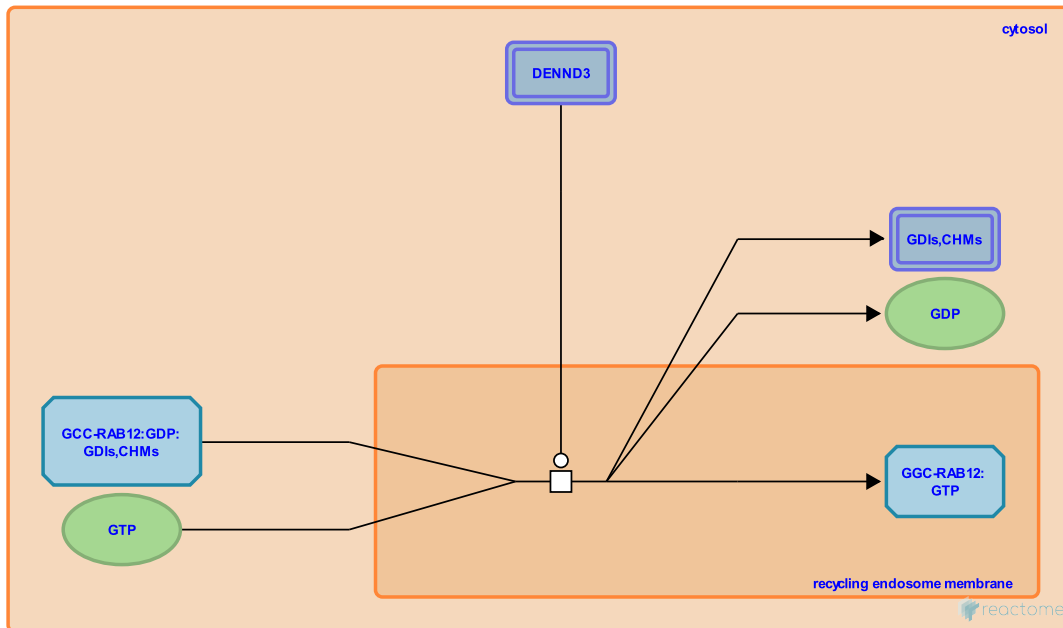
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8876454

Type: transition

Compartments: recycling endosome membrane, cytosol

Inferred from: DENND3 exchanges GTP for GDP on RAB12 (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Preceded by: p-ULK1 phosphorylates DENND3

RAB13 GEFs exchange GTP for GDP on RAB13 ↗

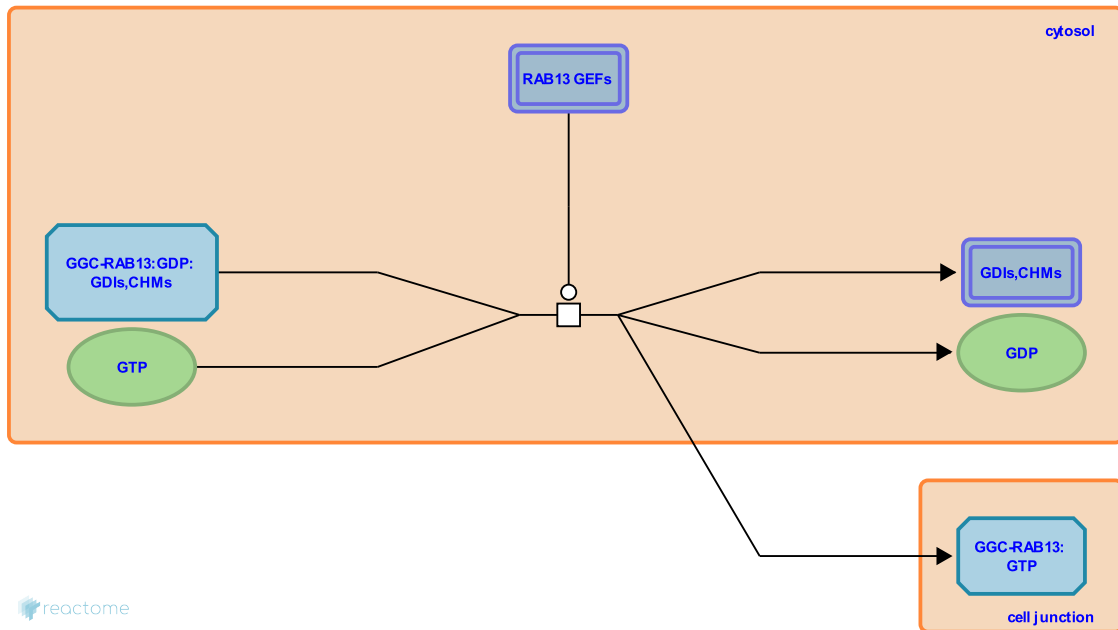
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8876615

Type: transition

Compartments: cytosol, cell junction

Inferred from: RAB13 GEFs exchange GTP for GDP on RAB13 (Homo sapiens)



reactome

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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

DENND6A,B exchange GTP for GDP on RAB14 ↗

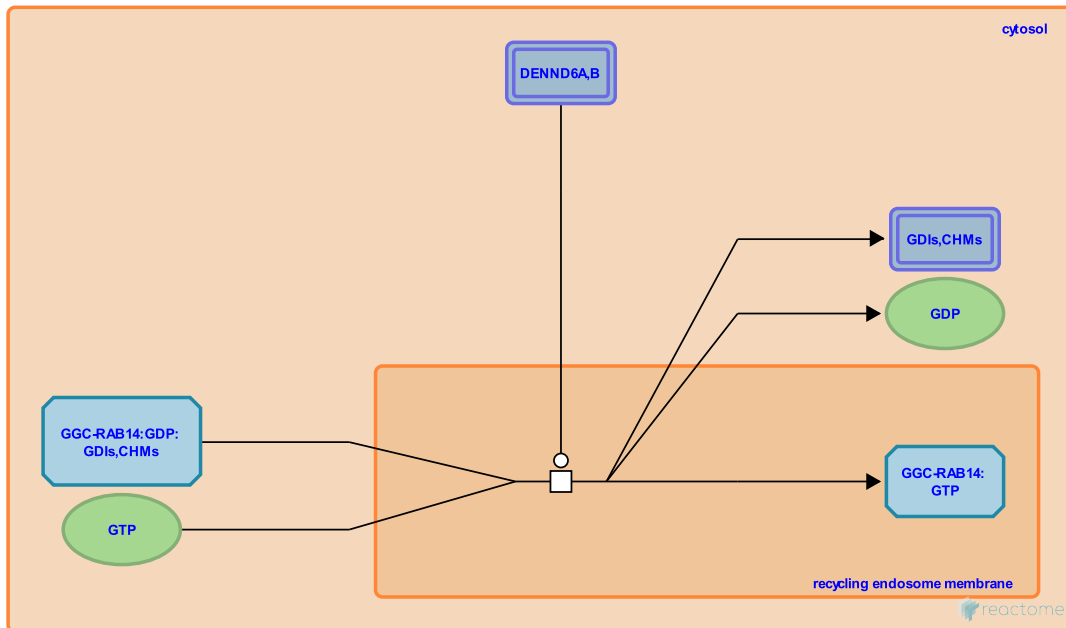
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8876616

Type: transition

Compartments: recycling endosome membrane, cytosol

Inferred from: DENND6A,B exchange GTP for GDP on RAB14 (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

RAB21 GEFs exchange GTP for GDP on RAB21 ↗

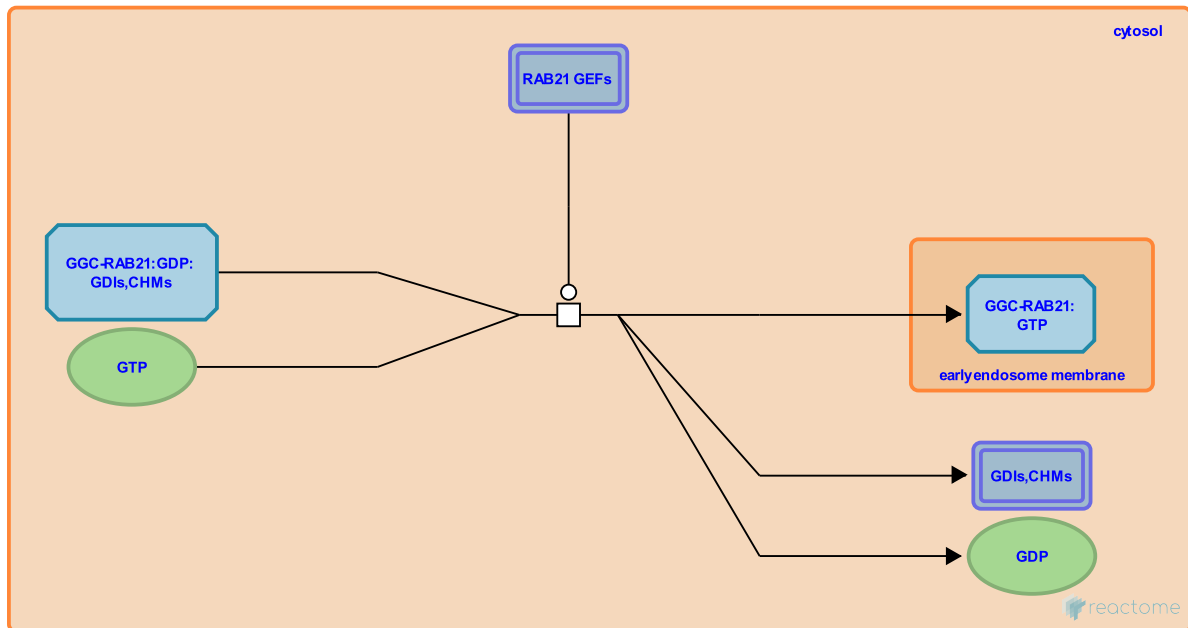
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8876837

Type: transition

Compartments: cytosol, early endosome membrane

Inferred from: RAB21 GEFs exchange GTP for GDP on RAB21 (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

MADD exchanges GTP for GDP on RAB27 ↗

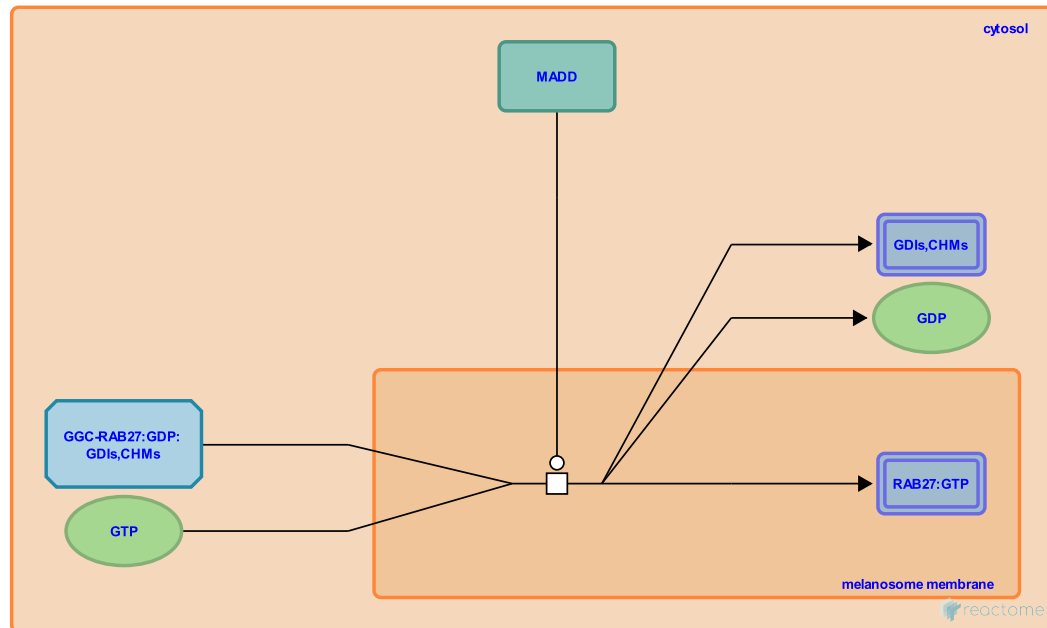
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8877308

Type: transition

Compartments: melanosome membrane, cytosol

Inferred from: MADD exchanges GTP for GDP on RAB27 (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

RAB31 GEFs exchange GTP for GDP on RAB31 ↗

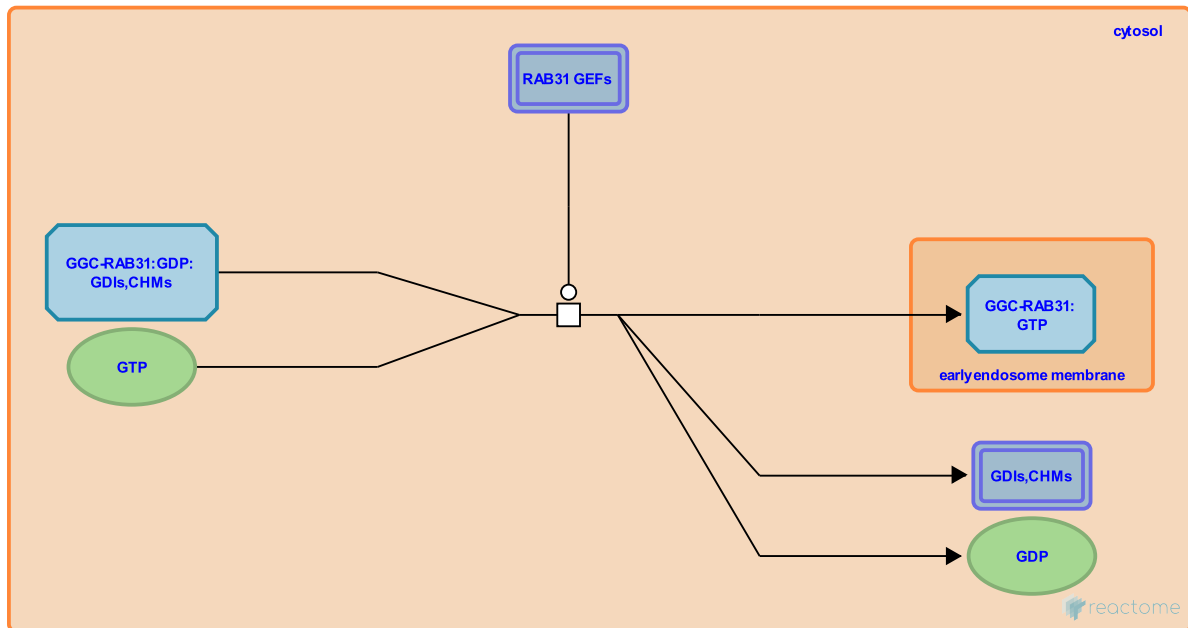
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8877311

Type: transition

Compartments: cytosol, early endosome membrane

Inferred from: RAB31 GEFs exchange GTP for GDP on RAB31 (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

YWHAE dimer binds phosphorylated DENND1 proteins ↗

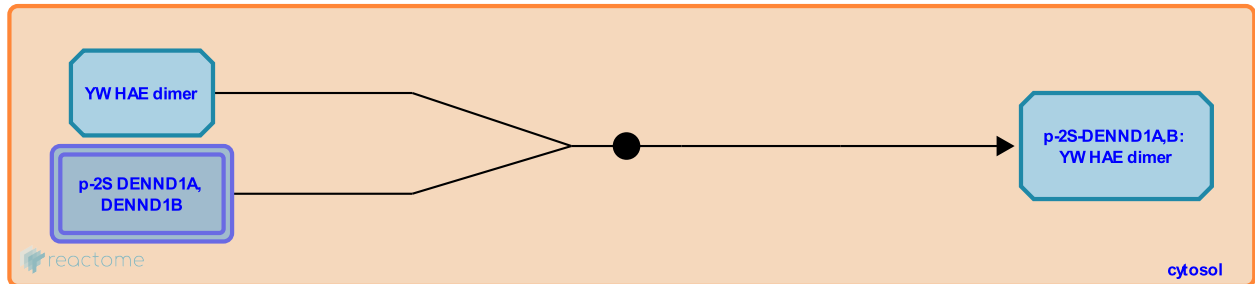
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8933452

Type: binding

Compartments: cytosol

Inferred from: YWHAE dimer binds phosphorylated DENND1 proteins (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Followed by: DENND1s exchange GTP for GDP on RAB35

DENND1s exchange GTP for GDP on RAB35 ↗

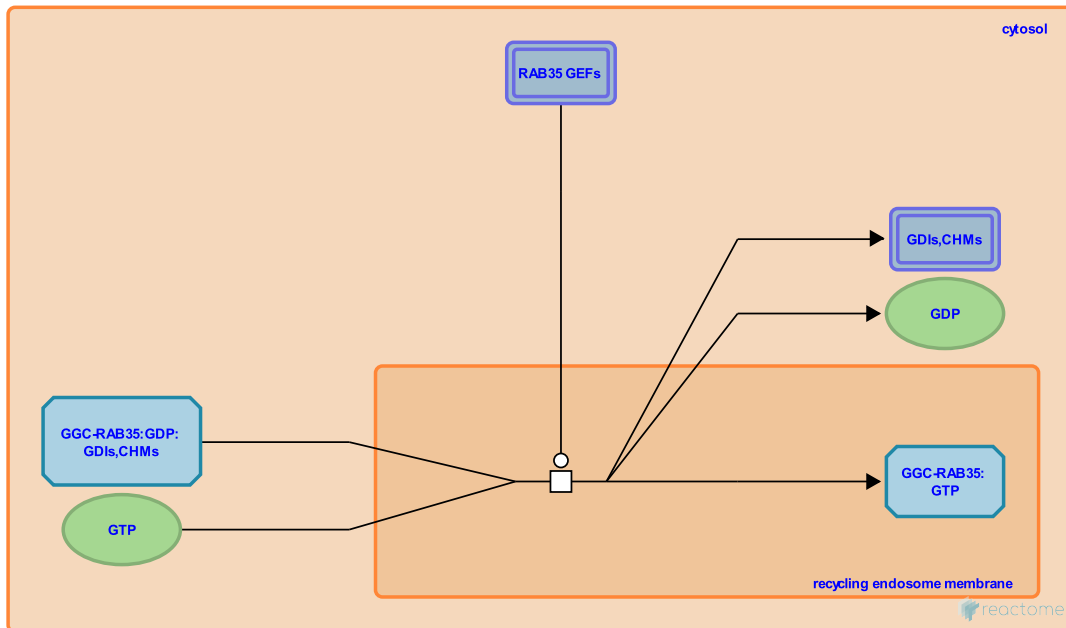
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8877612

Type: transition

Compartments: recycling endosome membrane, cytosol

Inferred from: DENND1s exchange GTP for GDP on RAB35 (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Preceded by: [YWHAE dimer binds phosphorylated DENND1 proteins](#)

HPS1:HPS4 exchange GTP for GDP on RAB32 and RAB38 ↗

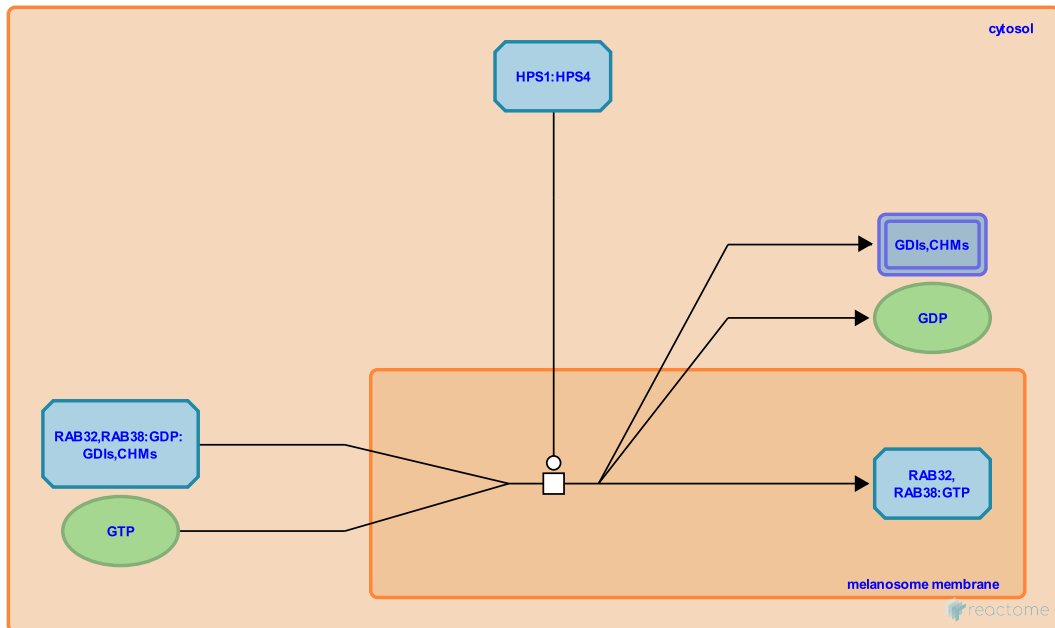
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8877760

Type: transition

Compartments: melanosome membrane, cytosol

Inferred from: HPS1:HPS4 exchange GTP for GDP on RAB32 and RAB38 (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

DENND5A,B exchange GTP for GDP on RAB39 ↗

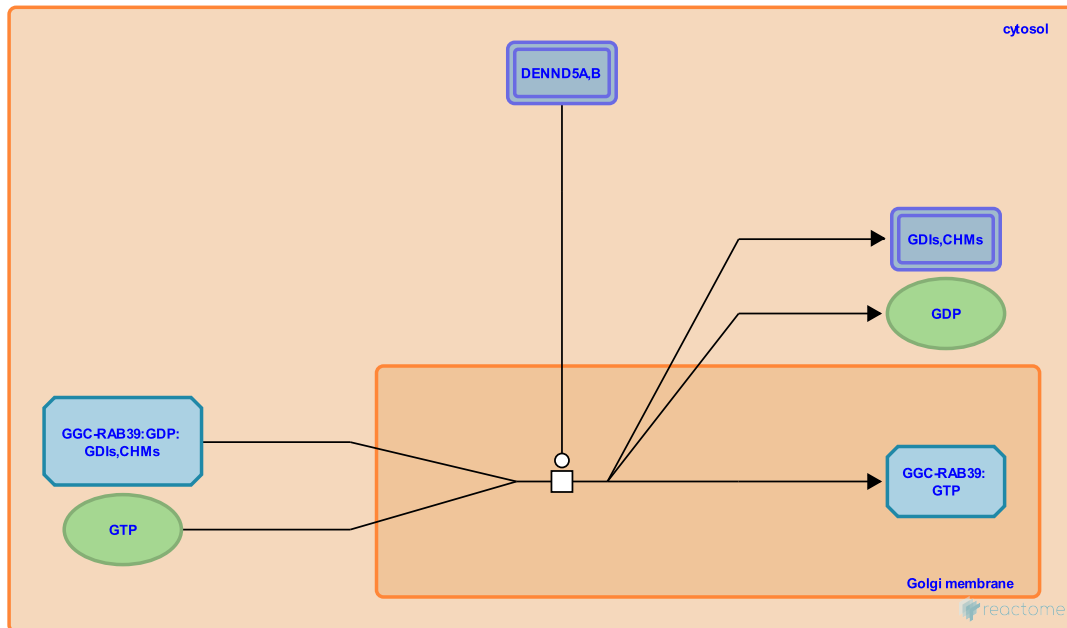
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8877813

Type: transition

Compartments: Golgi membrane, cytosol

Inferred from: DENND5A,B exchange GTP for GDP on RAB39 (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

RAB3GAP1:RAB3GAP2 exchanges GTP for GDP on RAB18 ↗

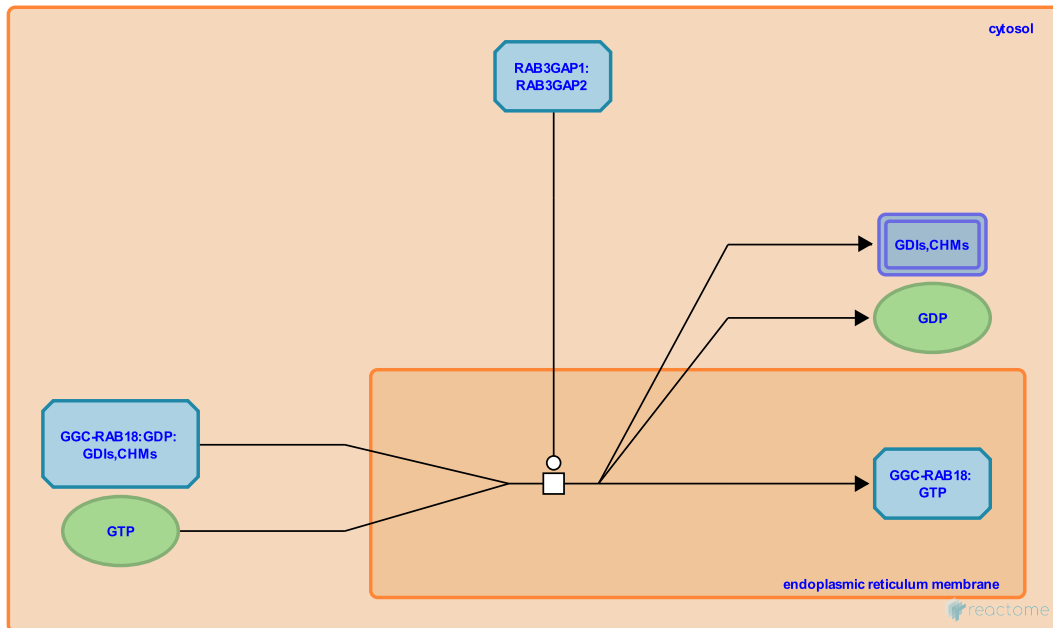
Location: RAB GEFs exchange GTP for GDP on RABs

Stable identifier: R-BTA-8877998

Type: transition

Compartments: endoplasmic reticulum membrane, cytosol

Inferred from: RAB3GAP1:RAB3GAP2 exchanges GTP for GDP on RAB18 (Homo sapiens)



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.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Table of Contents

Introduction	1
☰ RAB GEFs exchange GTP for GDP on RABs	2
↳ TRAPPC complexes exchange GTP for GDP on RAB1	3
↳ RAB3 GEFs exchange GTP for GDP on RAB3A	4
↳ RAB5 GEFs exchange GTP for GDP on RAB5	5
↳ RIC1-RGP1 exchanges GTP for GDP on RAB6	6
↳ MON1:CCZ1 exchanges GTP for GDP on RAB7	7
↳ RAB8 GEFs exchange GTP for GDP on RAB8	8
↳ RAB9 GEFs exchange GTP for GDP on RAB9	9
↳ DENND4s exchange GTP for GDP on RAB10	10
↳ p-ULK1 phosphorylates DENND3	11
↳ DENND3 exchanges GTP for GDP on RAB12	12
↳ RAB13 GEFs exchange GTP for GDP on RAB13	13
↳ DENND6A,B exchange GTP for GDP on RAB14	14
↳ RAB21 GEFs exchange GTP for GDP on RAB21	15
↳ MADD exchanges GTP for GDP on RAB27	16
↳ RAB31 GEFs exchange GTP for GDP on RAB31	17
↳ YWHAE dimer binds phosphorylated DENND1 proteins	18
↳ DENND1s exchange GTP for GDP on RAB35	19
↳ HPS1:HPS4 exchange GTP for GDP on RAB32 and RAB38	20
↳ DENND5A,B exchange GTP for GDP on RAB39	21
↳ RAB3GAP1:RAB3GAP2 exchanges GTP for GDP on RAB18	22
Table of Contents	23