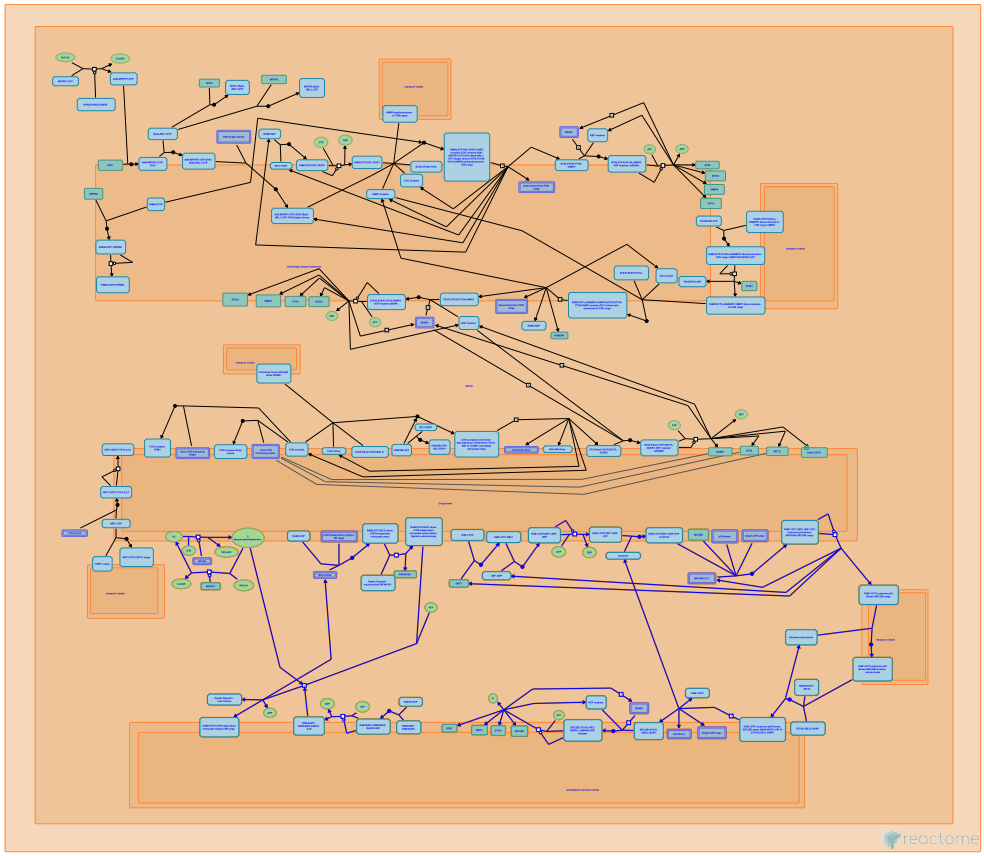
Golgi-to-ER retrograde transport



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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. ↗

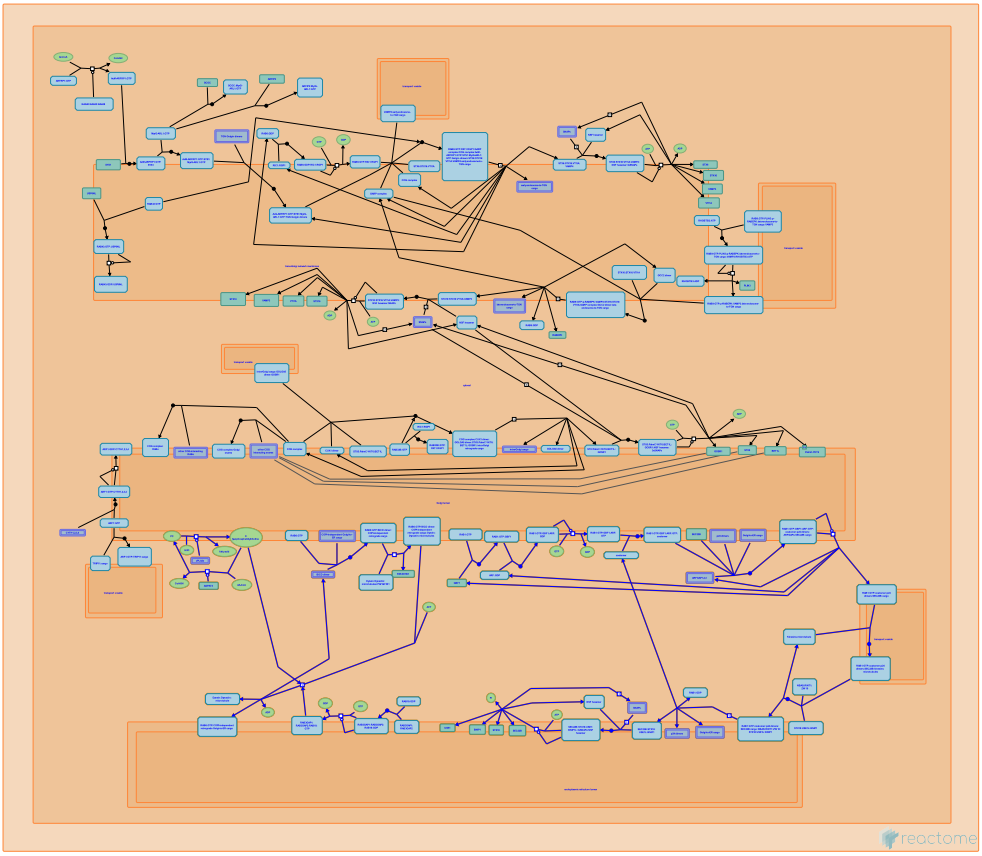
Fabregat, A., Korninger, F., Viteri, G., Sidiropoulos, K., Marin-Garcia, P., Ping, P. et al. (2018). Reactome graph database: Efficient access to complex pathway data. *PLoS computational biology, 14*, e1005968. ↗

Reactome database release: 88

This document contains 3 pathways (see Table of Contents)

Golgi-to-ER retrograde transport ↗

Stable identifier: R-HSA-8856688



Retrograde traffic from the cis-Golgi to the ERGIC or the ER occurs through either COPI-coated vesicles or through a less well characterized RAB6-dependent route that makes use of tubular carriers (reviewed in Lord et al, 2013; Spang et al, 2013; Heffernan and Simpson, 2014). The balance between these two pathways may be influenced cargo type and concentration and membrane composition, though the details remain to be worked out (reviewed in Heffernan and Simpson, 2014).

Literature references

Spang, A. (2013). Retrograde traffic from the Golgi to the endoplasmic reticulum. *Cold Spring Harb Perspect Biol, 5*. ↗

Ferro-Novick, S., Miller, EA., Lord, C. (2013). The highly conserved COPII coat complex sorts cargo from the endoplasmic reticulum and targets it to the golgi. *Cold Spring Harb Perspect Biol, 5*. ↗

Simpson, JC., Heffernan, LF. (2014). The trials and tubule-ations of Rab6 involvement in Golgi-to-ER retrograde transport. *Biochem. Soc. Trans., 42*, 1453-9. ↗

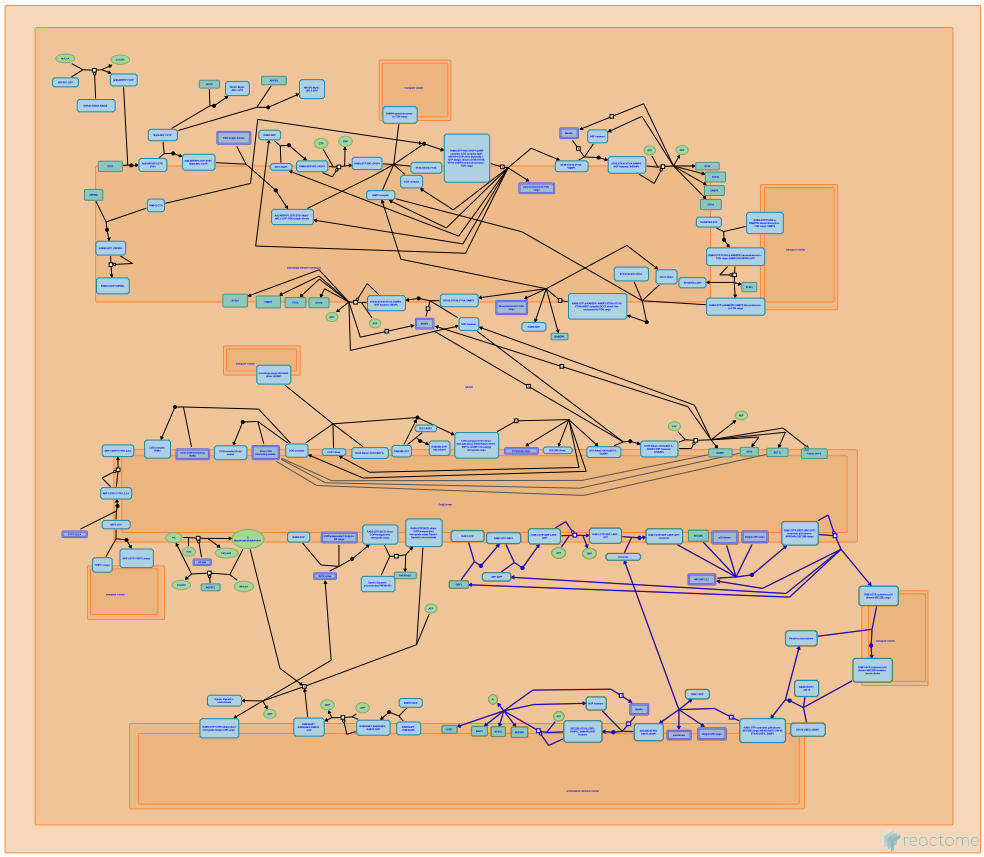
Editions

2016-01-06	Authored, Edited	Rothfels, K.
2016-02-02	Reviewed	Gillespie, ME.

COPI-dependent Golgi-to-ER retrograde traffic ↗

Location: Golgi-to-ER retrograde transport

Stable identifier: R-HSA-6811434



Retrograde traffic from the cis-Golgi to the ERGIC or the ER is mediated in part by microtubule-directed COPI-coated vesicles (Letourneur et al, 1994; Shima et al, 1999; Spang et al, 1998; reviewed in Lord et al, 2013; Spang et al, 2013). These assemble at the cis side of the Golgi in a GBF-dependent fashion and are tethered at the ER by the ER-specific SNAREs and by the conserved NRZ multisubunit tethering complex, known as DSL in yeast (reviewed in Tagaya et al, 2014; Hong and Lev, 2014). Typical cargo of these retrograde vesicles includes 'escaped' ER chaperone proteins, which are recycled back to the ER for reuse by virtue of their interaction with the Golgi localized KDEL receptors (reviewed in Capitani and Sallese, 2009; Cancino et al, 2013).

Literature references

Luini, A., Cancino, J., Jung, JE. (2013). Regulation of Golgi signaling and trafficking by the KDEL receptor. *Histochem. Cell Biol., 140*, 395-405. ↗

Scales, SJ., Kreis, TE., Pepperkok, R., Shima, DT. (1999). Segregation of COPI-rich and anterograde-cargo-rich domains in endoplasmic-reticulum-to-Golgi transport complexes. *Curr. Biol., 9*, 821-4. ↗

Hong, W., Lev, S. (2014). Tethering the assembly of SNARE complexes. *Trends Cell Biol., 24*, 35-43. ↗

Tagaya, M., Kimura, H., Inoue, H., Arasaki, K. (2014). Moonlighting functions of the NRZ (mammalian Dsl1) complex . *Front Cell Dev Biol, 2*, 25. ↗

Spang, A. (2013). Retrograde traffic from the Golgi to the endoplasmic reticulum. *Cold Spring Harb Perspect Biol, 5*. ↗

Editions

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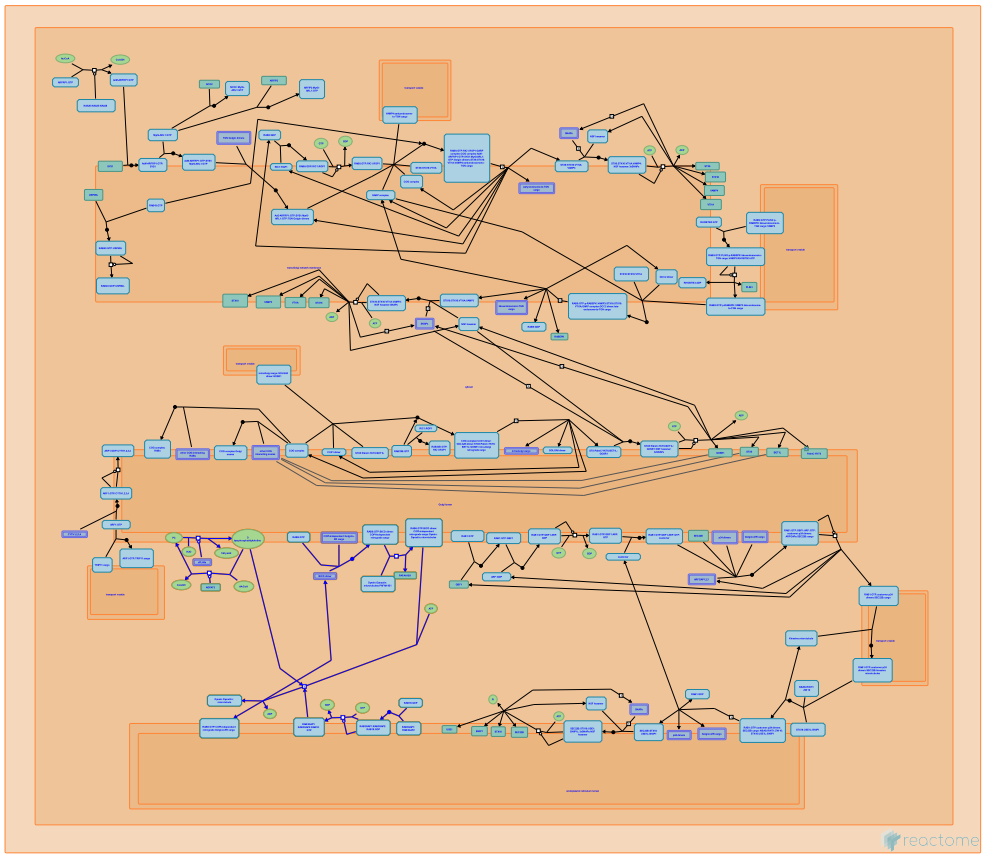
2016-02-02	Reviewed	Gillespie, ME.

COPI-independent Golgi-to-ER retrograde traffic ↗

Location: Golgi-to-ER retrograde transport

Stable identifier: R-HSA-6811436



In addition to the better characterized COPI-dependent retrograde Golgi-to-ER pathway, a second COPI-independent pathway has also been identified. This pathway is RAB6 dependent and transports cargo such as glycosylation enzymes and Shiga and Shiga-like toxin through tubular carriers rather than vesicles (White et al, 1999; Girod et al, 1999; reviewed in Heffernan and Simpson, 2014). In the absence of a COPI coat, the membrane curvature necessary to initiate tubulation may be provided through the action of phospholipase A, which hydrolyzes phospholipids at the sn2 position to yield lysophospholipids. This activity is countered by lysophospholipid acyltransferases, and the balance of these may influence whether transport tubules or transport vesicles form (de Figuiredo et al, 1998; reviewed in Bechler et al, 2012). RAB6-dependent tubules also depend on the dynein-dynactin motor complex and the hoomodimeric Bicaudal proteins (Matanis et al, 2002; Yamada et al, 2013; reviewed in Heffernan and Simpson, 2014).

Literature references

Bechler, ME., Brown, WJ., de Figueiredo, P. (2012). A PLA1-2 punch regulates the Golgi complex. *Trends Cell Biol., 22*, 116-24. ↗

Girod, A., White, J., Grill, S., Reinsch, S., Johannes, L., Stelzer, EH. et al. (1999). Rab6 coordinates a novel Golgi to ER retrograde transport pathway in live cells. *J. Cell Biol., 147*, 743-60. ↗

Weide, T., Grosveld, F., Matanis, T., Wulf, P., Barnekow, A., Galjart, N. et al. (2002). Bicaudal-D regulates COPI-independent Golgi-ER transport by recruiting the dynein-dynactin motor complex. *Nat. Cell Biol., 4*, 986-92. ↗

Drecktrah, D., Katzenellenbogen, JA., Strang, M., Brown, WJ., de Figueiredo, P. (1998). Evidence that phospholipase A2 activity is required for Golgi complex and trans Golgi network membrane tubulation. *Proc. Natl. Acad. Sci. U.S.A., 95*, 8642-7. ↗

Fukui, M., Mikuni, S., Jin, M., Kumamoto, K., Arai, Y., Tsukasaki, Y. et al. (2013). Rab6a releases LIS1 from a dynein idling complex and activates dynein for retrograde movement. *Nat Commun, 4*, 2033. ↗

Editions

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