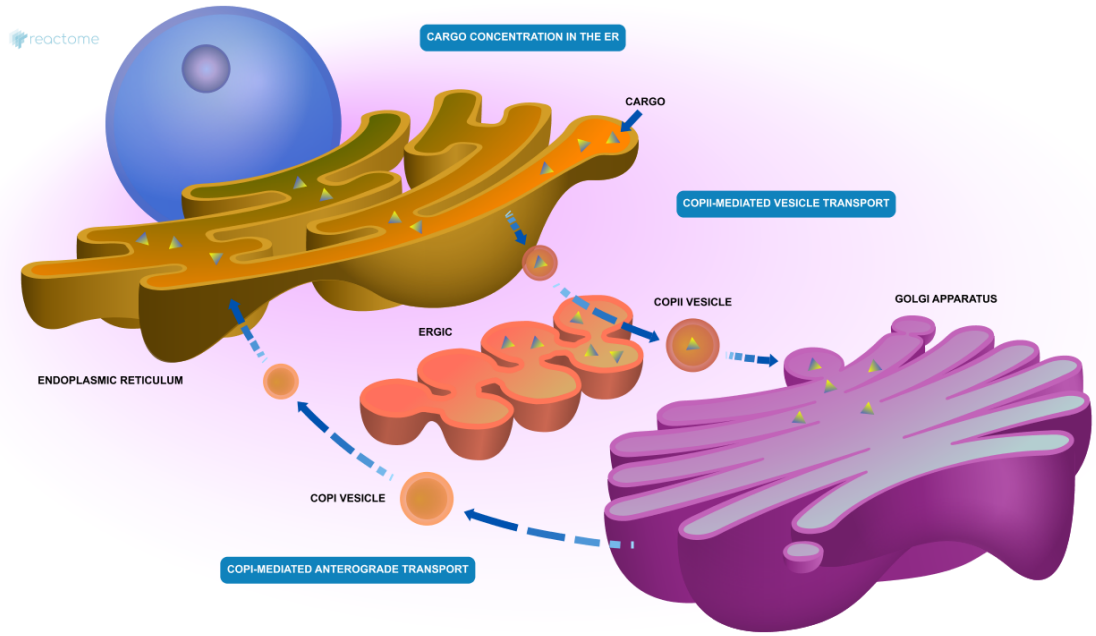
ER to Golgi Anterograde Transport



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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.

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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. ↗

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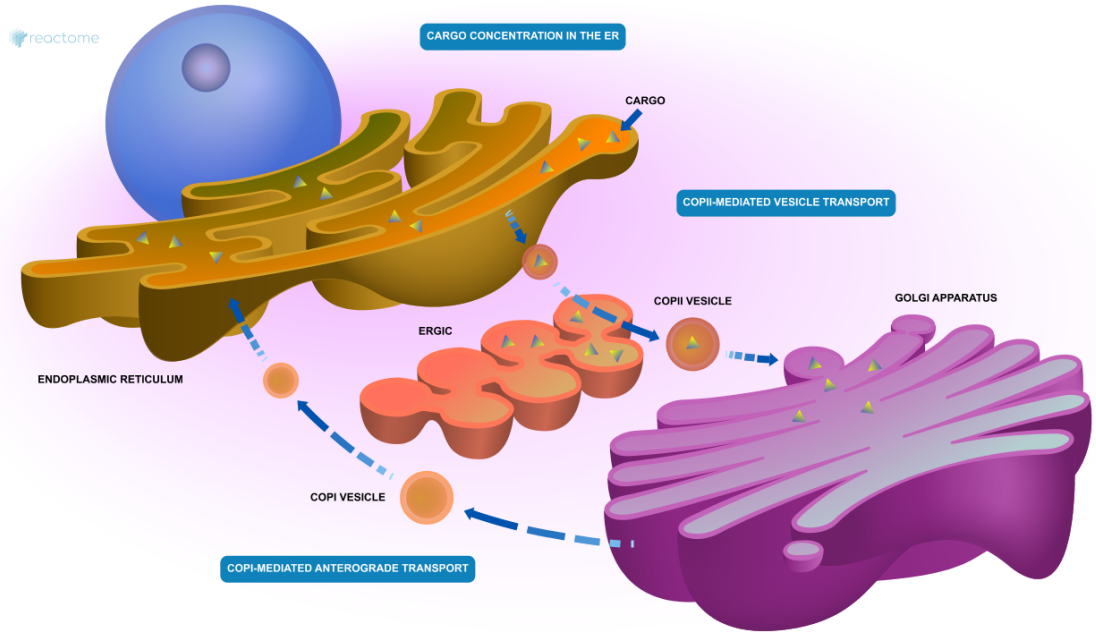
Fabregat, A., Jupe, S., Matthews, L., Sidiropoulos, K., Gillespie, M., Garapati, P. et al. (2018). The Reactome Pathway Knowledgebase. *Nucleic Acids Res, 46*, D649-D655. ↗

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. ↗

ER to Golgi Anterograde Transport ↗

Stable identifier: R-HSA-199977



Secretory cargo destined to be secreted or to arrive at the plasma membrane (PM) leaves the ER via distinct exit sites. This cargo is destined for the Golgi apparatus for further processing.

About 25% of the proteome may be exported from the ER in human cells. This cargo is recognized and concentrated into COPII vesicles, which range in size from 60-90 nm, and move cargo from the ER to the ERGIC. Soluble cargo in the ER lumen is concentrated into COPII vesicles through interaction with a receptor with the receptor subsequently recycled to the ER in COPI vesicles through retrograde traffic.

The ERGIC (ER-to-Golgi intermediate compartment, also known as vesicular-tubular clusters, VTCs) is a stable, biochemically distinct compartment located adjacent to ER exit sites.

Retrograde traffic makes use of microtubule-directed COPI-coated vesicles, carrying ER proteins and membrane back to the ER.

Literature references

Kirchhausen, Tomas. (2000). Three ways to make a vesicle. *Nat Rev Mol Cell Biol, 1*, 187-98. ↗

Editions

2007-07-14	Authored	Gillespie, ME.
2007-07-19	Edited	Gillespie, ME.
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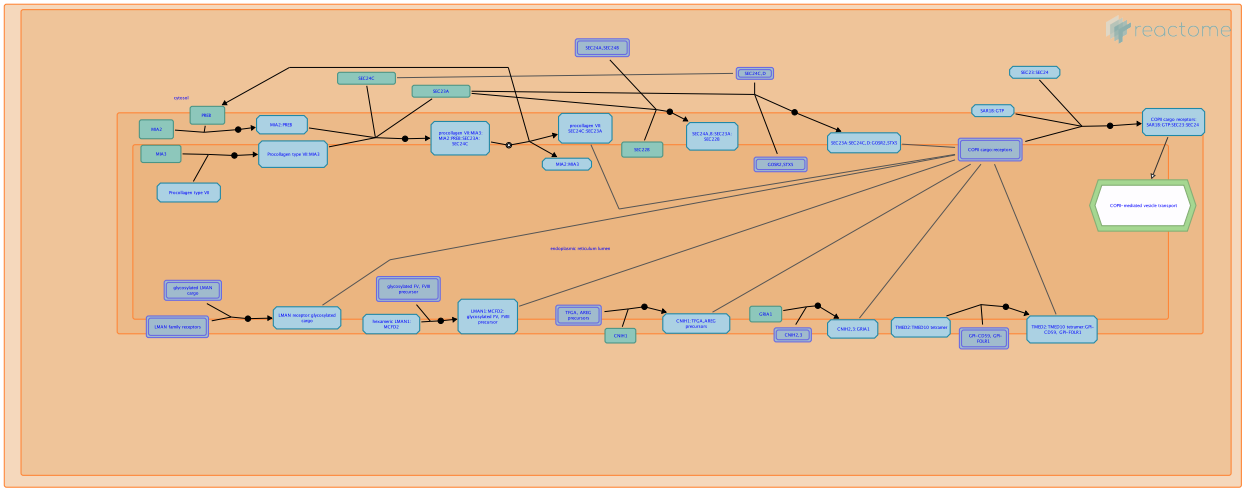
Cargo concentration in the ER ↗

Location: ER to Golgi Anterograde Transport

Stable identifier: R-HSA-5694530



Computational analysis suggests that ~25% of the proteome may be exported from the ER in human cells (Kanapin et al, 2003). These cargo need to be recognized and concentrated into COPII vesicles, which range in size from 60-90 nm, and which move cargo from the ER to the ERGIC in mammalian cells (reviewed in Lord et al, 2013; Szul and Sztul, 2011). Recognition of transmembrane cargo is mediated by interaction with one of the 4 isoforms of SEC24, a component of the inner COPII coat (Miller et al, 2002; Miller et al, 2003; Mossessova et al, 2003; Mancias and Goldberg, 2008). Soluble cargo in the ER lumen is concentrated into COPII vesicles through interaction with a receptor of the ERGIC-53 family, the p24 family or the ERV family. Each of these families of transmembrane receptors interact with cargo through their lumenal domains and with components of the COPII coat with their cytoplasmic domains and are packaged into the COPII vesicle along with the cargo. The receptors are subsequently recycled to the ER in COPI vesicles through retrograde traffic (reviewed in Dancourt and Barlowe, 2010). Packaging of large cargo such as fibrillar collagen depends on the transmembrane accessory factors MIA3 (also known as TANGO1) and CTAGE5. Like the ERGIC, p24 and ERV cargo receptors, MIA3 and MIA2 (also known as CTAGE5) interact both with the collagen cargo and with components of the COPII coat. Unlike the other cargo receptors, however, MIA3 and MIA2 are not loaded into the vesicle but remain in the ER membrane (reviewed in Malhotra and Erlmann, 2011; Malhotra et al, 2015).

Literature references

Kanapin, A., Batalov, S., Davis, MJ., Gough, J., Grimmond, S., Kawaji, H. et al. (2003). Mouse proteome analysis. *Genome Res., 13*, 1335-44. ↗

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Editions

2015-04-17	Authored	Rothfels, K.
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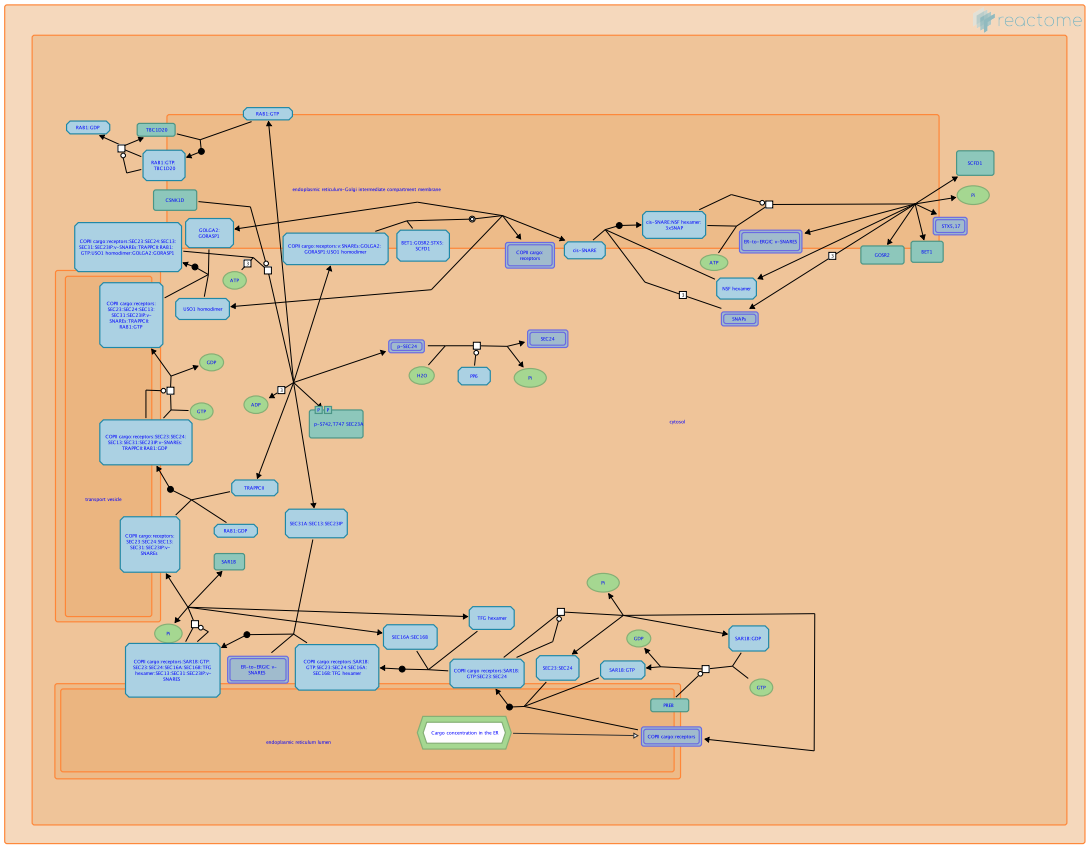
COPII-mediated vesicle transport ↗

Location: ER to Golgi Anterograde Transport

Stable identifier: R-HSA-204005



COPII components (known as Sec13p, Sec23p, Sec24p, Sec31p, and Sar1p in yeast) traffic cargo from the endoplasmic reticulum to the ER-Golgi intermediate compartment (ERGIC). COPII-coated vesicles were originally discovered in the yeast Saccharomyces cerevisiae using genetic approaches coupled with a cell-free assay. The mammalian counterpart of this pathway is represented here. Newly synthesized proteins destined for secretion are sorted into COPII-coated vesicles at specialized regions of the ER. These vesicles leave the ER, become uncoated and subsequently fuse with the ERGIC membrane.

Literature references

Kirchhausen, Tomas. (2000). Three ways to make a vesicle. *Nat Rev Mol Cell Biol, 1*, 187-98. ↗

Sato, K., Nakano, A. (2007). Mechanisms of COPII vesicle formation and protein sorting. *FEBS Lett, 581*, 2076-82. ↗

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COPI-mediated anterograde transport ↗

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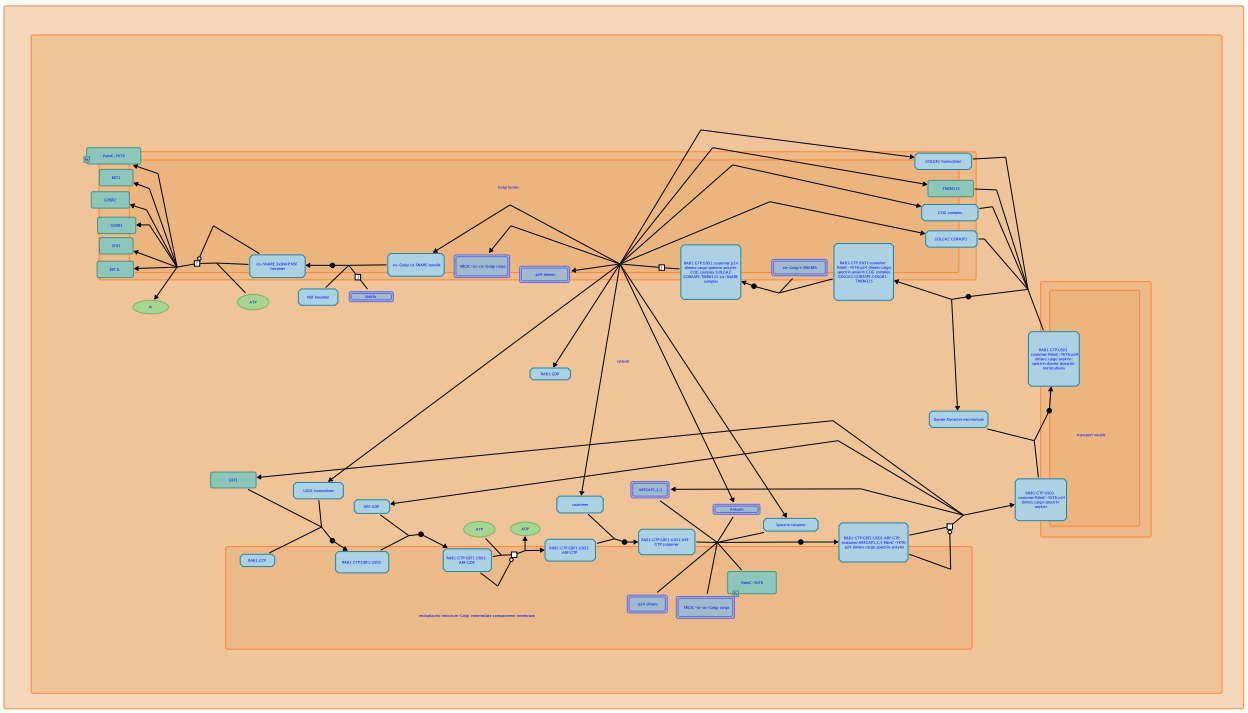
Stable identifier: R-HSA-6807878



The ERGIC (ER-to-Golgi intermediate compartment, also known as vesicular-tubular clusters, VTCs) is a stable, biochemically distinct compartment located adjacent to ER exit sites (Ben-Tekaya et al, 2005; reviewed in Szul and Sztul, 2011). The ERGIC concentrates COPII-derived cargo from the ER for further anterograde transport to the cis-Golgi and also recycles resident ER proteins back to the ER through retrograde traffic. Both of these pathways appear to make use of microtubule-directed COPI-coated vesicles (Pepperkok et al, 1993; Presley et al, 1997; Scales et al, 1997; Stephens and Pepperkok, 2002; Stephens et al, 2000; reviewed in Lord et al, 2001; Spang et al, 2013).

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Ben-Tekaya, H., Miura, K., Pepperkok, R., Hauri, HP. (2005). Live imaging of bidirectional traffic from the ERGIC. *J. Cell. Sci., 118*, 357-67. ↗

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Editions

2015-09-01	Authored, Edited	Rothfels, K.
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