SGMS2 transfers phosphocholine onto ceramide

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19/09/2024

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. ↗

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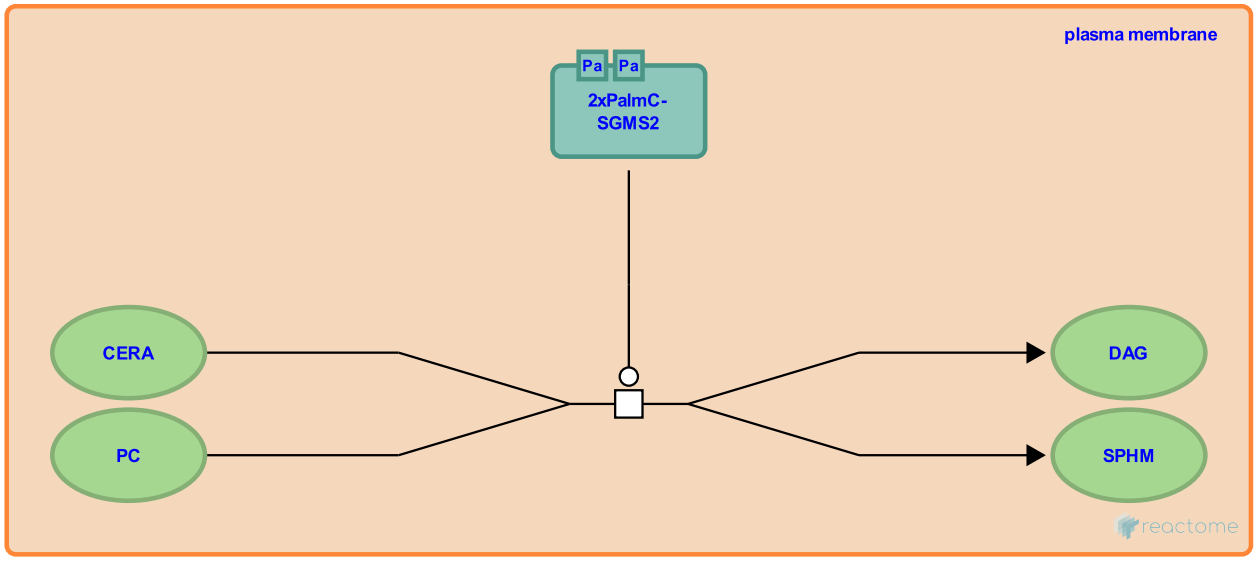
Stable identifier: R-HSA-429786

Type: transition

Compartments: plasma membrane



SGMS2 (sphingomyelin synthase 2) catalyzes the reversible reaction of phosphatidylcholine and ceramide to form sphingomyelin and diacylglycerol. Most SGMS2 activity is associated with the plasma membrane, although active enzyme is also present in the Golgi apparatus (Tafesse et al. 2007; Villani et al. 2008; Ding et al. 2008). Phosphatidylcholine was identified as the source of the phosphocholine moiety donated to ceramide in this reaction in studies of the mouse enzyme in the 1970s (Diringer et al., 1972; Ullman and Radin, 1974). The association of SGMS2 with the plasma membrane appears to require palmitoylation of at least two cysteine residues near the carboxy terminus (Tani and Kuge, 2009). SGMS2 is widely expressed in the body, and while studies of cultured cells indicate that this is a minor source of cellular sphingomyelin, blockage of SGMS2 activity inhibits cell growth. SGMS2 deficiency causes forms of osteoporosis (CDL, MIM:126550; CDLSMD, MIM:126550) (Huitema et al., 2004; Tafesse et al., 2007; reviewed by Chen & Cao, 2017).

Literature references

Chen, Y., Cao, Y. (2017). The sphingomyelin synthase family: proteins, diseases, and inhibitors. *Biol Chem, 398*, 1319-1325. ↗

Radin, NS., Ullman, MD. (1974). The enzymatic formation of sphingomyelin from ceramide and lecithin in mouse liver. *J Biol Chem, 249*, 1506-12. ↗

Koch, MA., Diringer, H., Anderer, FA., Marggraf, WD. (1972). Evidence for a new biosynthetic pathway of sphingomyelin in SV 40 transformed mouse cells. *Biochem Biophys Res Commun, 47*, 1345-52. ↗

van der Poel, S., Uphoff, A., Tafesse, FG., Huitema, K., Hermansson, M., Holthuis, JC. et al. (2007). Both sphingomyelin synthases SMS1 and SMS2 are required for sphingomyelin homeostasis and growth in human HeLa cells. *J Biol Chem, 282*, 17537-47. ↗

Tani, M., Kuge, O. (2009). Sphingomyelin synthase 2 is palmitoylated at the COOH-terminal tail, which is involved in its localization in plasma membranes. *Biochem Biophys Res Commun, 381*, 328-32. ↗

Editions

2009-08-21	Authored, Edited	D'Eustachio, P.
2009-08-21	Reviewed	Jassal, B.
2009-11-19	Reviewed	Hannun, YA., Luberto, C.
2023-10-24	Reviewed	D'Eustachio, P.