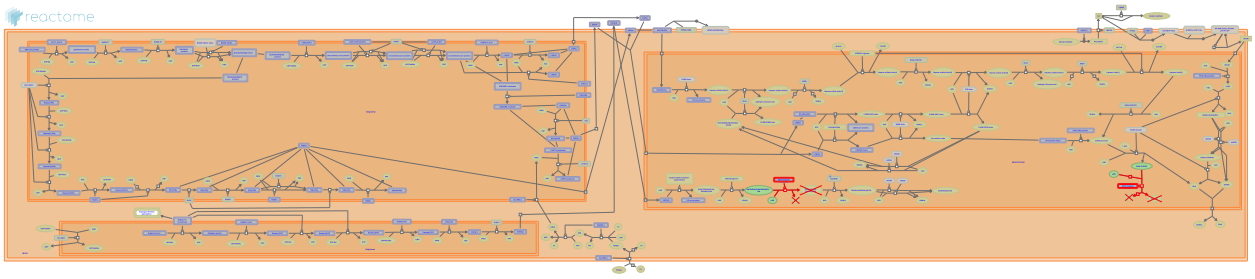
MPS IV - Morquio syndrome B



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29/04/2024

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. ↗

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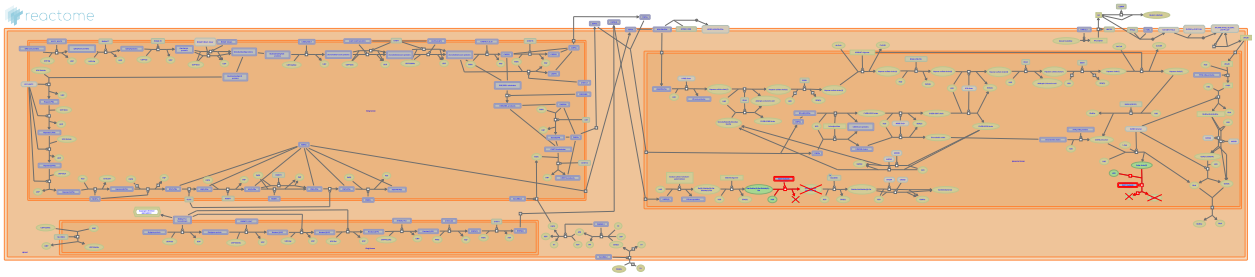
Fabregat, A., Jupe, S., Matthews, L., Sidiropoulos, K., Gillespie, M., Garapati, P. et al. (2018). The Reactome Pathway Knowledgebase. *Nucleic Acids Res, 46*, D649-D655. ↗

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. ↗

MPS IV - Morquio syndrome B ↗

Stable identifier: R-HSA-2206308

Diseases: mucopolysaccharidosis



Defects in beta-galactosidase (GLB1; MIM:611458) can result in GM1 gangliosidosis (GM1; MIM:230500) (Nishimoto et al. 1991) (not described here), with several phenotypes indicating mental deterioration, as well as in mucopolysaccharidosis IVB, a characteristic mucopolysaccharidosis with no neurological symptoms (Callahan 1999).

Mucopolysaccharidosis IVB (MPS IVB, Morquio's syndrome B; MIM:253010) is a rare, autosomal recessive mucopolysaccharide storage disease characterized by intracellular accumulation of keratan sulfate (KS), skeletal dysplasia and corneal clouding. There is no central nervous system involvement, intelligence is normal and there is increased KS excretion in urine (Suzuki et al. "Beta-galactosidase deficiency (beta-galactosidosis): GM1 gangliosidosis and Morquio B disease", p3775-3809 in Stryer et al. 2001). MPSIVB is caused by a defect in betagalactosidase (GLB1), which normally cleaves terminal galactosyl residues from glycosaminoglycans, gangliosides and glycoproteins. The GLB1 gene spans 62.5 kb and contains 16 exons (Oshima et al.1988, Santamaria et al. 2007) and maps to chromosome 3p21.33 (Takano & Yamanouchi 1993).

Literature references

Callahan, JW. (1999). Molecular basis of GM1 gangliosidosis and Morquio disease, type B. Structure-function studies of lysosomal beta-galactosidase and the non-lysosomal beta-galactosidase-like protein. *Biochim. Biophys. Acta, 1455*, 85-103. ↗

Santamaria, R., Chabas, A., Blanco, M., Grinberg, D., Vilageliu, L. (2007). Identification of 14 novel GLB1 mutations, including five deletions, in 19 patients with GM1 gangliosidosis from South America. *Clin. Genet., 71*, 273-9. ↗

Suzuki, Y., Oshima, A., Sakuraba, H., Tsuji, A., Nagao, Y. (1988). Cloning, sequencing, and expression of cDNA for human beta-galactosidase. *Biochem. Biophys. Res. Commun., 157*, 238-44. ↗

Nishimoto, J., Inui, K., Nanba, E., Suzuki, K., Okada, S. (1991). GM1-gangliosidosis (genetic beta-galactosidase deficiency): identification of four mutations in different clinical phenotypes among Japanese patients. *Am. J. Hum. Genet., 49*, 566-74. ↗

Yamanouchi, Y., Takano, T. (1993). Assignment of human beta-galactosidase-A gene to 3p21.33 by fluorescence in situ hybridization. *Hum. Genet., 92*, 403-4. ↗

Editions

2012-04-26	Authored, Edited	Jassal, B.
2012-08-27	Reviewed	Coutinho, MF., Alves, S.

Defective GLB1 does not hydrolyse a glycosaminoglycan ↗

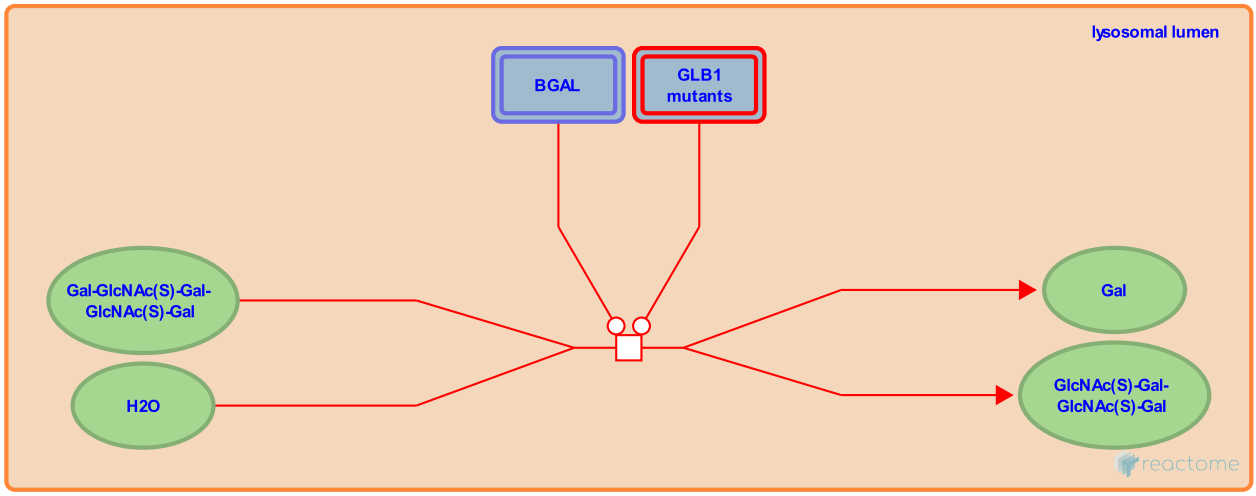
Location: MPS IV - Morquio syndrome B

Stable identifier: R-HSA-2265534

Type: transition

Compartments: lysosomal lumen

Diseases: mucopolysaccharidosis



Defects in beta-galactosidase (GLB1, MIM:611458) result in galactose moieties not being hydrolysed from keratan sulfate (KS) or the GAG linker chain, a tetrasccharide sequence required for some GAG biosyntheses to take place. Mucopolysaccharidosis IV B (MPSIVB, Morquio's syndrome B; MIM:253010) is the result of GLB1 deficiency. GLB1 mutations causing severe phenotypes are R482C (Ishii et al. 1995), W509C (Oshima et al. 1991), Y83C (Santamaria et al. 2006) and W273L Paschke et al. 2001. Mild phenotypes where a partial loss of enzyme activity occurs can involve the mutants G438E, N484K, T500A (Bagshaw et al. 2002) and Y83H (Ishii et al. 1995). These mild phenotype mutants are not detailed here.

Literature references

Suzuki, Y., Ishii, N., Oshima, A., Sakuraba, H., Sukegawa, K., Matsuda, I. et al. (1995). Clinical and molecular analysis of a Japanese boy with Morquio B disease. *Clin. Genet., 48*, 103-8. ↗

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Hoefler, G., Radeva, B., Hoeltzenbein, M., Kreimer-Erlacher, H., Paschke, E., Levade, T. et al. (2001). Mutation analyses in 17 patients with deficiency in acid beta-galactosidase: three novel point mutations and high correlation of mutation W273L with Morquio disease type B. *Hum. Genet., 109*, 159-66. ↗

Fukuhara, Y., Yoshida, K., Suzuki, Y., Sakuraba, H., Oshima, A., Shimmoto, M. (1991). Human beta-galactosidase gene mutations in morquio B disease. *Am J Hum Genet, 49*, 1091-3. ↗

Editions

2012-05-21	Authored, Edited	Jassal, B.
2012-08-27	Reviewed	Coutinho, MF., Alves, S.

Defective GLB1 does not hydrolyse linker chain(2) ↗

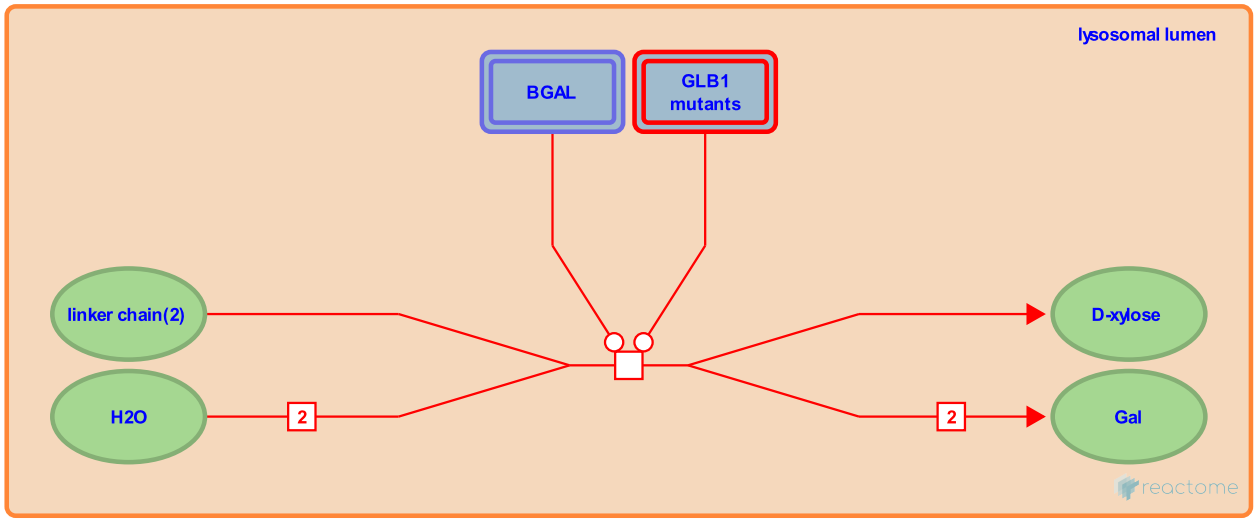
Location: MPS IV - Morquio syndrome B

Stable identifier: R-HSA-9036061

Type: transition

Compartments: lysosomal lumen

Diseases: mucopolysaccharidosis



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Suzuki, Y., Ishii, N., Oshima, A., Sakuraba, H., Sukegawa, K., Matsuda, I. et al. (1995). Clinical and molecular analysis of a Japanese boy with Morquio B disease. *Clin. Genet., 48*, 103-8. ↗

Coll, MJ., Vilageliu, L., Chabás, A., Santamaria, R., Miranda, CS., Grinberg, D. (2006). Twenty-one novel mutations in the GLB1 gene identified in a large group of GM1-gangliosidosis and Morquio B patients: possible common origin for the prevalent p.R59H mutation among gypsies. *Hum. Mutat., 27*, 1060. ↗

Hoefler, G., Radeva, B., Hoeltzenbein, M., Kreimer-Erlacher, H., Paschke, E., Levade, T. et al. (2001). Mutation analyses in 17 patients with deficiency in acid beta-galactosidase: three novel point mutations and high correlation of mutation W273L with Morquio disease type B. *Hum. Genet., 109*, 159-66. ↗

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