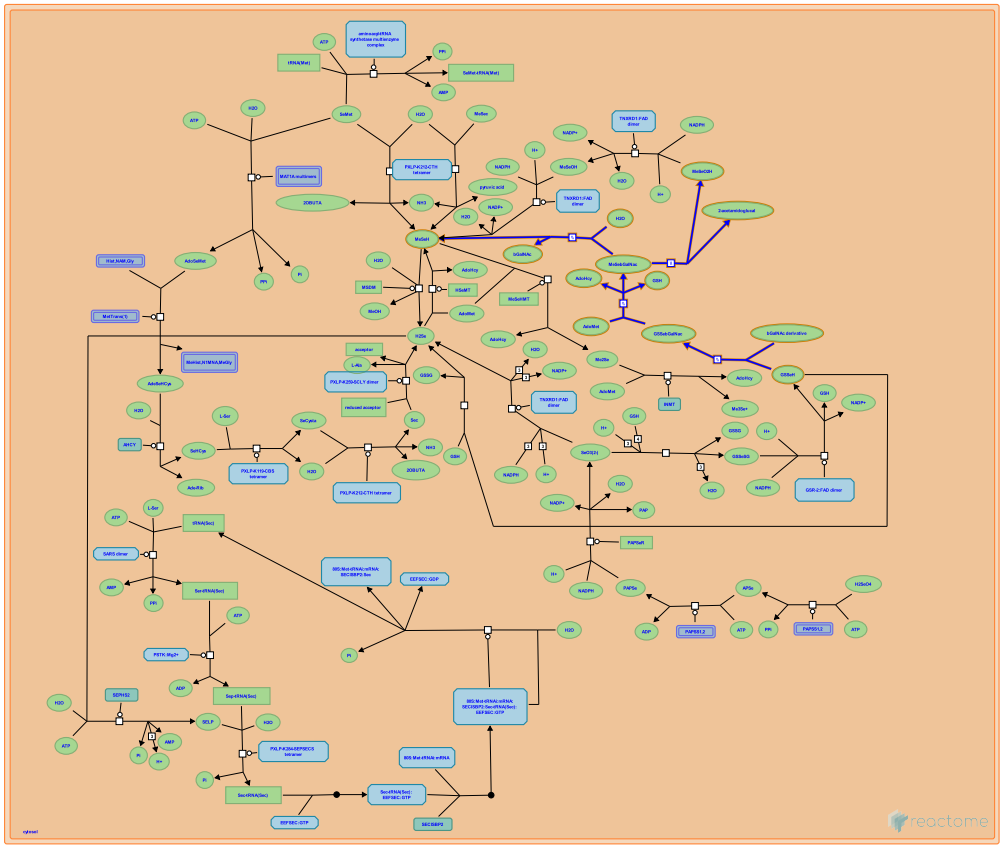
Formation of selenosugars for excretion



D'Eustachio, P., Rush, MG., Williams, MG.

European Bioinformatics Institute, New York University Langone Medical Center, Ontario Institute for Cancer Research, Oregon Health and Science University.

17/05/2024

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. ↗

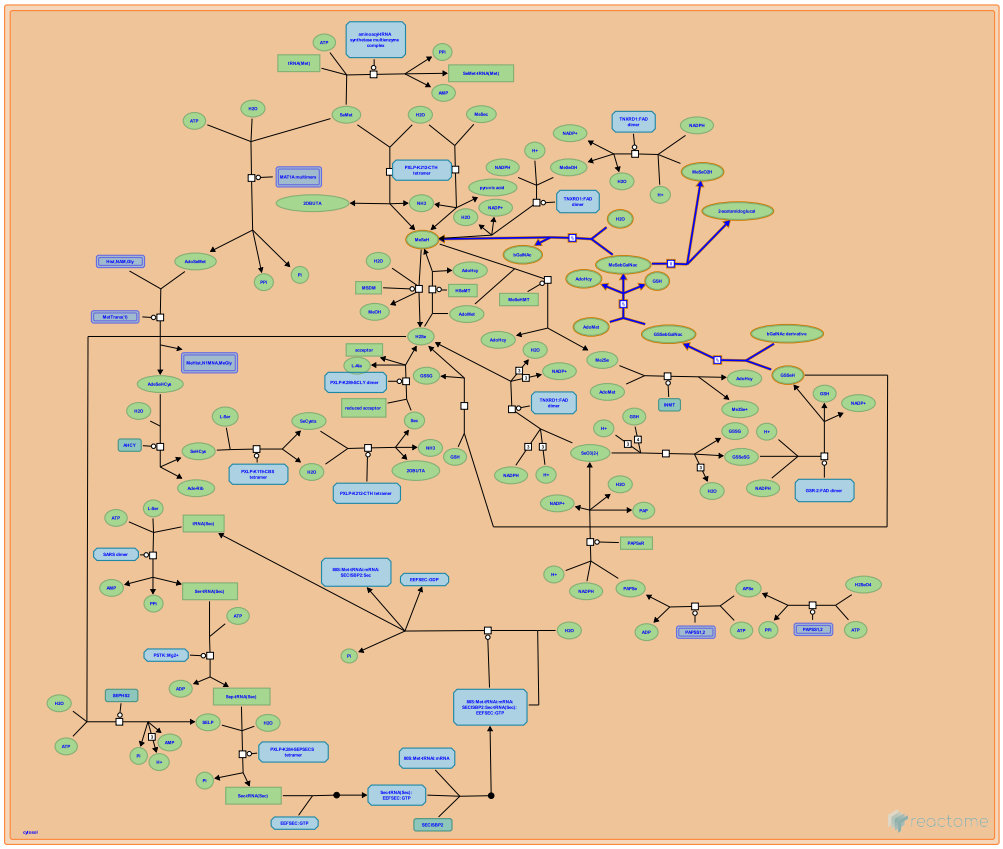
Sidiropoulos, K., Viteri, G., Sevilla, C., Jupe, S., Webber, M., Orlic-Milacic, M. et al. (2017). Reactome enhanced pathway visualization. *Bioinformatics, 33*, 3461-3467. ↗

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. ↗

Formation of selenosugars for excretion ↗

Stable identifier: R-HSA-2408499



Selenite (SeO3(2-)), potentially formed from oxidised H2Se, combines with glutathione (GSH) and 1beta-methylseleno-N-acetyl-D-galactosamine derivative to form selonosugars which are further metabolised and then excreted.

Literature references

Suzuki, KT., Suzuki, N., Somekawa, L. (2006). Distribution and reuse of 76Se-selenosugar in selenium-deficient rats. *Toxicol. Appl. Pharmacol., 216*, 303-8. ↗

Kobayashi, Y., Suzuki, KT., Ogra, Y., Takayama, H., Aimi, N., Ishiwata, K. (2002). Selenosugars are key and urinary metabolites for selenium excretion within the required to low-toxic range. *Proc. Natl. Acad. Sci. U.S.A., 99*, 15932-6. ↗

Editions

2014-05-06	Authored	Williams, MG.
2015-08-29	Edited	D'Eustachio, P.
2015-08-30	Reviewed	Rush, MG.

GSSeH combines with bGalNAc derivative to form GSSebGalNac ↗

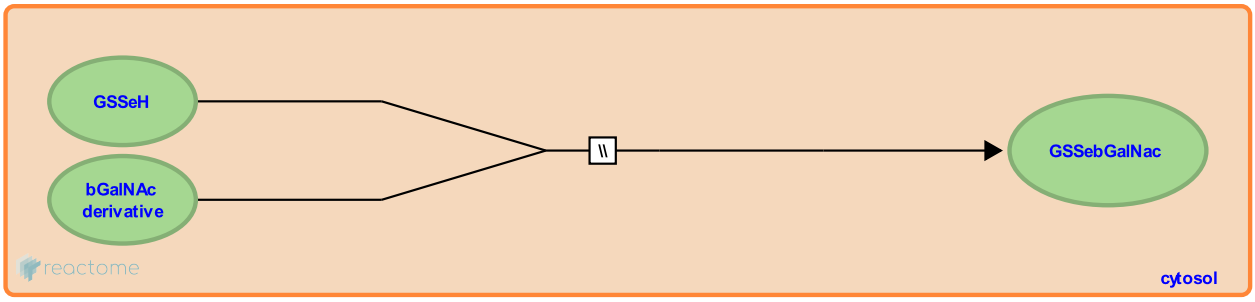
Location: Formation of selenosugars for excretion

Stable identifier: R-HSA-5333607

Type: omitted

Compartments: cytosol

Inferred from: GSSeH combines with bGalNAc derivative to form GSSebGalNac (Rattus norvegicus)



1beta-methylseleno-N-acetyl-D-galactosamine (bGalNAc) derivative combines with glutathioselenol (GSSeH) to form 1beta-glutathionylseleno-N-acetyl-D-galactosamine (GSSebGalNac) aka selenosugar A by an unknown mechanism. The actual enzyme or enzymes involved have yet to be identified. This reaction is inferred from the event in rat (Kobayashi et al. 2002).

Followed by: GSSebGalNac is reduced and methylated to MeSebGalNac

Literature references

Kobayashi, Y., Suzuki, KT., Ogra, Y., Takayama, H., Aimi, N., Ishiwata, K. (2002). Selenosugars are key and urinary metabolites for selenium excretion within the required to low-toxic range. *Proc. Natl. Acad. Sci. U.S.A., 99*, 15932-6. ↗

Editions

2014-05-06	Authored	Williams, MG.
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2015-08-30	Reviewed	Rush, MG.

GSSebGalNac is reduced and methylated to MeSebGalNac ↗

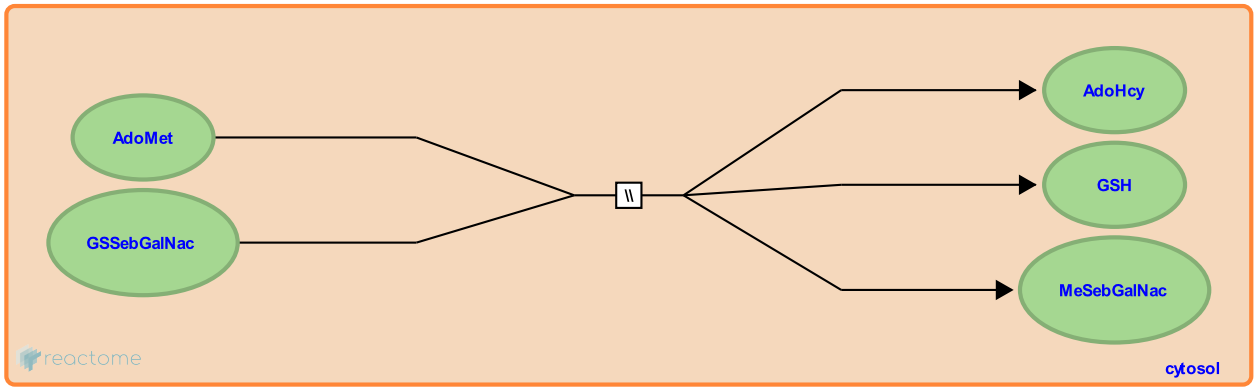
Location: Formation of selenosugars for excretion

Stable identifier: R-HSA-5333608

Type: omitted

Compartments: cytosol

Inferred from: GSSebGalNac is reduced and methylated to MeSebGalNac (Rattus norvegicus)



1beta-glutathionylseleno-N-acetyl-D-galactosamine (GSSebGalNac) aka selenosugar A is converted into 1beta-methylseleno-N-acetyl-D-galactosamine (MeSebGalNac) aka selenosugar B by an unknown mechanism. The actual enzyme or enzymes involved have yet to be identified. This reaction is inferred from the event in rat (Kobayashi et al. 2002).

Preceded by: GSSeH combines with bGalNAc derivative to form GSSebGalNac

Followed by: MeSebGalNac is hydrolysed to MeSeH and bGalNac, MeSebGalNac is oxidatively cleaved to MeSeO2H and 2-acetamidoglucal

Literature references

Kobayashi, Y., Suzuki, KT., Ogra, Y., Takayama, H., Aimi, N., Ishiwata, K. (2002). Selenosugars are key and urinary metabolites for selenium excretion within the required to low-toxic range. *Proc. Natl. Acad. Sci. U.S.A., 99*, 15932-6. ↗

Editions

2014-05-06	Authored	Williams, MG.
2015-08-29	Edited	D'Eustachio, P.
2015-08-30	Reviewed	Rush, MG.

MeSebGalNac is hydrolysed to MeSeH and bGalNac ↗

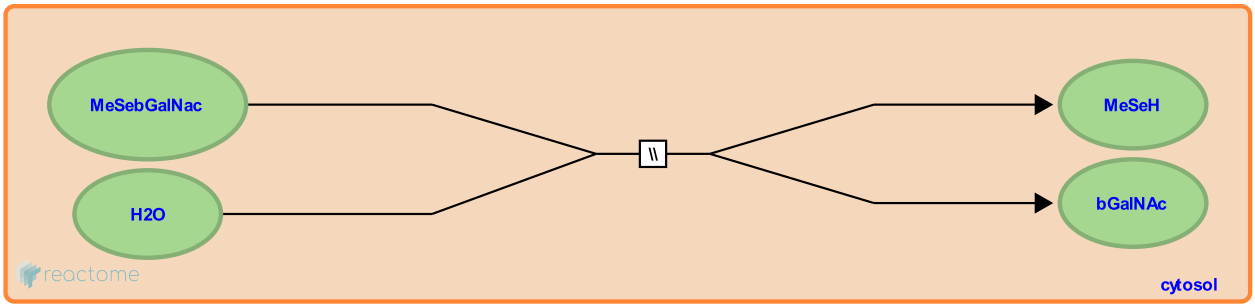
Location: Formation of selenosugars for excretion

Stable identifier: R-HSA-5333609

Type: omitted

Compartments: cytosol

Inferred from: MeSebGalNac is hydrolysed to MeSeH and bGalNac (Rattus norvegicus)



1beta-methylseleno-N-acetyl-D-galactosamine (MeSebGalNac) aka selenosugar B is hydrolysed to methylselenol (MeSeH) and N-acetyl-beta-D-galactosamine (bGalNac) by an unknown mechanism. The actual enzyme or enzymes involved have yet to be identified. This reaction is inferred from the event in rat (Suzuki et al. 2006).

Preceded by: GSSebGalNac is reduced and methylated to MeSebGalNac

Literature references

Suzuki, KT., Suzuki, N., Somekawa, L. (2006). Distribution and reuse of 76Se-selenosugar in selenium-deficient rats. *Toxicol. Appl. Pharmacol., 216*, 303-8. ↗

Editions

2014-05-06	Authored	Williams, MG.
2015-08-29	Edited	D'Eustachio, P.
2015-08-30	Reviewed	Rush, MG.

MeSebGalNac is oxidatively cleaved to MeSeO2H and 2-acetamidoglucal ↗

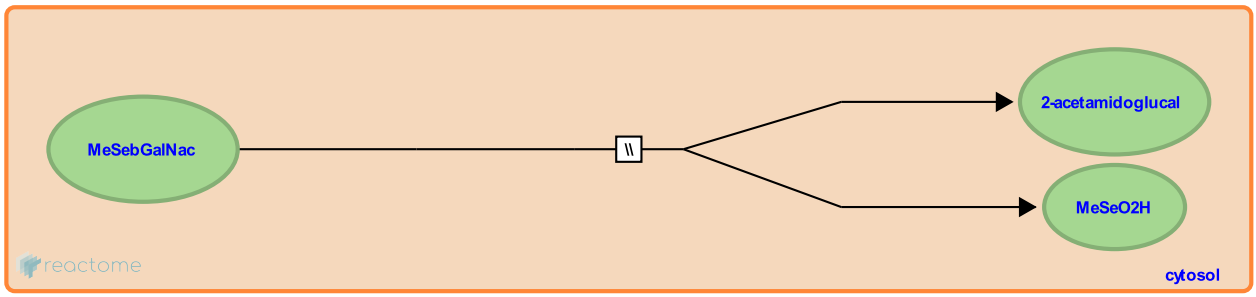
Location: Formation of selenosugars for excretion

Stable identifier: R-HSA-5333612

Type: omitted

Compartments: cytosol

Inferred from: MeSebGalNac is oxidatively cleaved to MeSeO2H and 2-acetamidoglucal (Rattus norvegicus)



1beta-methylseleno-N-acetyl-D-galactosamine (MeSebGalNac) aka selenosugar B is oxidatively cleaved to methylseleninic acid (MeSeO2H) and 2-acetamidoglucal by an unknown mechanism. The actual enzyme or enzymes involved have yet to be identified. This reaction is inferred from the event in rat (Suzuki et al. 2006).

Preceded by: GSSebGalNac is reduced and methylated to MeSebGalNac

Literature references

Suzuki, KT., Suzuki, N., Somekawa, L. (2006). Distribution and reuse of 76Se-selenosugar in selenium-deficient rats. *Toxicol. Appl. Pharmacol., 216*, 303-8. ↗

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