

GLUT2

Glucose transporter 2 (GLUT2) also known as **solute carrier family 2 (facilitated glucose transporter), member 2 (SLC2A2)** is a transmembrane carrier protein that enables protein facilitated glucose movement across cell membranes. It is the principal transporter for transfer of glucose between liver and blood, and has a role in renal glucose reabsorption. It is also capable of transporting fructose.^[1] Unlike GLUT4, it does not rely on insulin for facilitated diffusion.

In humans, this protein is encoded by the *SLC2A2* gene.^{[2][3]}

1 Tissue distribution

GLUT2 is found in cellular membranes of:

- liver (Primary)
- pancreatic β cell (Primary)
- hypothalamus (Not overly significant)
- basolateral membrane of small intestine and apical GLUT2 is also suggested.^[4]
- basolateral membrane of renal tubular cells^[5]

2 Function

GLUT2 has high capacity for glucose but low affinity (high K_m , ca. 15-20 mM) and thus functions as part of the "glucose sensor" in pancreatic β -cells. It is a very efficient carrier for glucose.^{[6][7]}

GLUT2 also carries glucosamine.^[8]

When the glucose concentration in the lumen of the small intestine goes above 30mM, such as occurs in the fed-state, GLUT2 is up-regulated at the brush border membrane, enhancing the capacity of glucose transport. Basolateral GLUT2 in enterocytes also aids in the transport of fructose into the bloodstream through glucose-dependent cotransport.

3 Clinical significance

Defects in the *SLC2A2* gene are associated with a particular type of glycogen storage disease called Fanconi-Bickel syndrome.^[9]

In drug-treated diabetic pregnancies in which glucose levels in the woman are uncontrolled, neural tube and cardiac defects in the early-developing brain, spine, and heart depend upon functional GLUT2 carriers, and defects in the GLUT2 gene have been shown to be protective against such defects in rats.^[10] However, whilst a lack of GLUT2 adaptability^[11] is negative, it is important to remember the fact that the main result of untreated gestational diabetes appears to cause babies to be of above-average size, which may well be an advantage that is managed very well with a healthy GLUT2 status.

Maintaining a regulated osmotic balance of sugar concentration between the blood circulation and the interstitial spaces is critical in some cases of edema including cerebral edema.

GLUT2 appears to be particularly important to osmoregulation, and preventing edema-induced stroke, transient ischemic attack or coma, especially when blood glucose concentration is above average.^[12] GLUT2 could reasonably be referred to as the "diabetic glucose transporter" or a "stress hyperglycemia glucose transporter."

4 Interactive pathway map

Click on genes, proteins and metabolites below to link to respective articles. ^[8 1]

```
[[File:
[[<div style="display:block; width:100px; height:0px;
overflow:hidden; position:relative; left:222.5px;
top:828px; background:transparent; border-top:3px
blue solid"></div>]]
[[<div style="display:block; width:63.
6666666666666666px; height:0px; overflow:hidden;
position:relative; left:695.6666666666667px;
top:1197px; background:transparent; border-top:3px
blue solid"></div>]]
[[<div style="display:block; width:100px; height:0px;
overflow:hidden; position:relative; left:801.0px;
top:1029.6666666666667px; background:transparent;
border-top:3px blue solid"></div>]]
[[<div style="display:block; width:60px;
height:0px; overflow:hidden; position:relative;
left:555.3333333333333px; top:991.1666666666667px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:100px; height:0px;
```

```

overflow:hidden; position:relative; left:386.0px;
top:594px; background:transparent; border-top:3px
blue solid"></div>]]
[[<div style="display:block; width:100px; height:0px;
overflow:hidden; position:relative; left:723.0px;
top:1086px; background:transparent; border-top:3px
blue solid"></div>]]
[[<div style="display:block; width:60px; height:0px;
overflow:hidden; position:relative; left:386.0px;
top:140.655462184874px; background:transparent;
border-top:3px blue solid"></div>]]
[[<div style="display:block; width:60px;
height:0px; overflow:hidden; position:relative;
left:386.999999999999px; top:882.666666666667px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:100px;
height:0px; overflow:hidden; position:relative;
left:477.650000000001px; top:942.5px; background:
transparent; border-top:3px blue solid"></div>]]
[[<div style="display:block; width:60px; height:
0px; overflow:hidden; position:relative; left:
386.9999999999994px; top:432.616246498599px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:60px;
height:0px; overflow:hidden; position:relative;
left:384.8991596638656px; top:277.627450980392px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:60px; height:0px;
overflow:hidden; position:relative; left:386.0px;
top:200.655462184874px; background:transparent;
border-top:3px blue solid"></div>]]
[[<div style="display:block; width:100px; height:0px;
overflow:hidden; position:relative; left:222.5px;
top:390.333333333333px; background:transparent;
border-top:3px blue solid"></div>]]
[[<div style="display:block; width:63.
6666666666666px; height:0px; overflow:hidden;
position:relative; left:695.666666666667px;
top:1237px; background:transparent; border-top:3px
blue solid"></div>]]
[[<div style="display:block; width:60px; height:
0px; overflow:hidden; position:relative; left:
386.9999999999994px; top:502.666666666667px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:60px;
height:0px; overflow:hidden; position:relative;
left:555.333333333333px; top:891.666666666667px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:60px;
height:0px; overflow:hidden; position:relative;
left:322.999999999999px; top:981.666666666668px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:63.
6666666666666px; height:0px; overflow:hidden;
position:relative; left:695.666666666667px;
top:1137px; background:transparent; border-top:3px
blue solid"></div>]]
[[<div style="display:block; width:100px; height:0px;
overflow:hidden; position:relative; left:222.5px;
top:103.3666666666667px; background:transparent;
border-top:3px blue solid"></div>]]
[[<div style="display:block; width:100px; height:0px;
overflow:hidden; position:relative; left:222.5px;
top:315.274509803922px; background:transparent;
border-top:3px blue solid"></div>]]
[[<div style="display:block; width:63.
6666666666666px; height:0px; overflow:hidden;
position:relative; left:695.666666666667px;
top:1157px; background:transparent; border-top:3px
blue solid"></div>]]
[[<div style="display:block; width:60px;
height:0px; overflow:hidden; position:relative;
left:657.999999999997px; top:992.333333333333px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:100px; height:0px;
overflow:hidden; position:relative; left:222.5px;
top:749px; background:transparent; border-top:3px
blue solid"></div>]]
[[<div style="display:block; width:60px;
height:0px; overflow:hidden; position:relative;
left:386.999999999999px; top:696.666666666667px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:60px;
height:0px; overflow:hidden; position:relative;
left:386.999999999999px; top:843.666666666667px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:60px; height:
0px; overflow:hidden; position:relative; left:
386.9999999999994px; top:412.616246498599px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:100px;
height:0px; overflow:hidden; position:relative;
left:801.000000000001px; top:945.5px; background:
transparent; border-top:3px blue solid"></div>]]
[[<div style="display:block; width:60px;
height:0px; overflow:hidden; position:relative;
left:386.999999999999px; top:862.666666666667px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:100px; height:0px;
overflow:hidden; position:relative; left:222.5px;
top:223.3666666666667px; background:transparent;
border-top:3px blue solid"></div>]]
[[<div style="display:block; width:63.
6666666666666px; height:0px; overflow:hidden;
position:relative; left:695.666666666667px;

```



```

[[<div style="display:block; width:60px; height:
0px; overflow:hidden; position:relative; left:
117.66666666666674px; top:405.6666666666666px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:60px; height:
0px; overflow:hidden; position:relative; left:
117.66666666666674px; top:445.6666666666666px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:63.
3333333333333px; height:0px; overflow:hidden;
position:relative; left:125.0000000000004px;
top:616.3333333333333px; background:transparent;
border-top:3px blue solid"></div>]]
[[<div style="display:block; width:63.
3333333333333px; height:0px; overflow:hidden;
position:relative; left:125.0000000000004px;
top:636.3333333333333px; background:transparent;
border-top:3px blue solid"></div>]]
[[<div style="display:block; width:60px; height:
0px; overflow:hidden; position:relative; left:
113.00000000000006px; top:799.3333333333333px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:60px; height:
0px; overflow:hidden; position:relative; left:
113.00000000000006px; top:779.3333333333333px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:60px; height:
0px; overflow:hidden; position:relative; left:
104.29411764705867px; top:952.3333333333333px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:60px; height:
0px; overflow:hidden; position:relative; left:
104.29411764705867px; top:972.3333333333333px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:60px; height:
0px; overflow:hidden; position:relative; left:
104.29411764705867px; top:932.3333333333333px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:60px; height:0px;
overflow:hidden; position:relative; left:89.0px;
top:1044.6666666666667px; background:transparent;
border-top:3px blue solid"></div>]]
[[<div style="display:block; width:60px; height:0px;
overflow:hidden; position:relative; left:89.0px;
top:1064.6666666666667px; background:transparent;
border-top:3px blue solid"></div>]]
[[<div style="display:block; width:60px; height:0px;
overflow:hidden; position:relative; left:89.0px;
top:1104.6666666666667px; background:transparent;
border-top:3px blue solid"></div>]]
[[<div style="display:block; width:60px; height:0px;

```

```

overflow:hidden; position:relative; left:89.0px;
top:1084.6666666666667px; background:transparent;
border-top:3px blue solid"></div>]]
[[<div style="display:block; width:100px;
height:0px; overflow:hidden; position:relative;
left:197.36666666666667px; top:1129.3666666666667px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:193px;
height:0px; overflow:hidden; position:relative;
left:539.9495798319327px; top:314.941176470588px;
background:transparent; border-top:3px blue
solid"></div>]]
[[<div style="display:block; width:163px;
height:0px; overflow:hidden; position:relative;
left:541.9495798319327px; top:358.941176470588px;
background:transparent; border-top:3px green
solid"></div>]]
[[<div style="display:block; width:95px; height:0px;
overflow:hidden; position:relative; left:870.0px;
top:1149px; background:transparent; border-top:3px
blue solid"></div>]]
[[<div style="display:block; width:80px; height:0px;
overflow:hidden; position:relative; left:593.0px;
top:1076px; background:transparent; border-top:3px
green solid"></div>]]
[[<div style="display:block; width:80px; height:0px;
overflow:hidden; position:relative; left:593.0px;
top:1096px; background:transparent; border-top:3px
blue solid"></div>]]

```

```

[[
]]
|{{{bSize}}}px|alt=Glycolysis and Gluconeogenesis
edit]]

```

File:WP534.png

Glycolysis and Gluconeogenesis edit

- [1] The interactive pathway map can be edited at WikiPathways: “GlycolysisGluconeogenesis_WP534”.

5 See also

- Glucose transporter

^[13]== References ==

- [1] Gwyn W. Gould , Helen M. Thomas , Thomas J. Jess , Graeme I. Bell (May 1991). “Expression of human glucose transporters in *Xenopus* oocytes: kinetic characterization and substrate specificities of the erythrocyte, liver, and brain isoforms”. *Biochemistry* **30** (21): 5139–5145. doi:10.1021/bi00235a004.
- [2] Froguel P, Zouali H, Sun F, Velho G, Fukumoto H, Passa P, Cohen D (July 1991). “CA repeat polymorphism in the glucose transporter GLUT 2 gene”. *Nucleic Acids*



The image above contains clickable links

- Res.* **19** (13): 3754. doi:10.1093/nar/19.13.3754-a. PMC 328421. PMID 1852621.
- [3] Uldry M, Thorens B (2004). “The SLC2 family of facilitated hexose and polyol transporters”. *Pflugers Arch* **447** (5): 480–489. doi:10.1007/s00424-003-1085-0. PMID 12750891.
- [4] Kellett GL, Brot-Laroche E (2005). “Apical GLUT2: a major pathway of intestinal sugar absorption”. *Diabetes* **54** (10): 3056–62. doi:10.2337/diabetes.54.10.3056. PMID 16186415.
- [5] Freitas HS, Schaan BD, Seraphim PM, Nunes MT, Machado UF (June 2005). “Acute and short-term insulin-induced molecular adaptations of GLUT2 gene expression in the renal cortex of diabetic rats”. *Mol. Cell. Endocrinol.* **237** (1-2): 49–57. doi:10.1016/j.mce.2005.03.005. PMID 15869838.
- [6] Guillam MT, Hümmeler E, Schaerer E, Yeh JI, Birnbaum MJ, Beermann F, Schmidt A, Dériaz N, Thorens B, Wu JY (November 1997). “Early diabetes and abnormal post-natal pancreatic islet development in mice lacking Glut-2”. *Nat. Genet.* **17** (3): 327–30. doi:10.1038/ng1197-327. PMID 9354799.
- [7] Efrat S (November 1997). “Making sense of glucose sensing”. *Nat. Genet.* **17** (3): 249–50. doi:10.1038/ng1197-249. PMID 9354775.
- [8] Uldry M, Ibberson M, Hosokawa M, Thorens B (July 2002). “GLUT2 is a high affinity glucosamine

transporter”. *FEBS Lett.* **524** (1-3): 199–203. doi:10.1016/S0014-5793(02)03058-2. PMID 12135767.

- [9] Santer R, Groth S, Kinner M, Dombrowski A, Berry GT, Brodehl J, Leonard JV, Moses S, Norgren S, Skovby F, Schneppenheim R, Steinmann B, Schaub J (January 2002). “The mutation spectrum of the facilitative glucose transporter gene SLC2A2 (GLUT2) in patients with Fanconi-Bickel syndrome”. *Hum. Genet.* **110** (1): 21–9. doi:10.1007/s00439-001-0638-6. PMID 11810292.
- [10] Li R, Thorens B, Loeken MR (March 2007). “Expression of the gene encoding the high-Km glucose transporter 2 by the early postimplantation mouse embryo is essential for neural tube defects associated with diabetic embryopathy”. *Diabetologia* **50** (3): 682–9. doi:10.1007/s00125-006-0579-7. PMID 17235524.
- [11] Thomson AB, Wild G (March 1997). “Adaptation of intestinal nutrient transport in health and disease. Part I”. *Dig. Dis. Sci.* **42** (3): 453–69. doi:10.1023/A:1018807120691. PMID 9073126.
- [12] Stolarczyk E, Le Gall M, Even P, Houllier A, Seradas P, Brot-Laroche E, Leturque A (2007). Maedler, Kathrin, ed. “Loss of sugar detection by GLUT2 affects glucose homeostasis in mice”. *PLoS ONE* **2** (12): e1288. doi:10.1371/journal.pone.0001288. PMC 2100167. PMID 18074013.
- [13] Duddela, Srikanth; Nataraj Sekhar, P.; Padmavati, G. V.; Banerjee, Amit Kumar; Murty, U. S. N. (11 September 2009). “Probing the structure of human glucose transporter 2 and analysis of protein ligand interactions”. *Medicinal Chemistry Research* **19** (8): 836–853. doi:10.1007/s00044-009-9234-4.

6 External links

- Glucose Transporter Type 2 at the US National Library of Medicine Medical Subject Headings (MeSH)

7 Text and image sources, contributors, and licenses

7.1 Text

- **GLUT2** *Source:* <https://en.wikipedia.org/wiki/GLUT2?oldid=697851303> *Contributors:* Bobblewik, Alteripse, JackWasey, Arcadian, Jakob Suckale, AJR, Mallocks, Finbarr Saunders, Fang Aili, Jacqui M, Drphilharmonic, ****mech****, Cydebot, DRHagen, Magioladitis, Boghog, Mikael Häggström, AndreasJSbot, Jdolno7brand, KristinaHanspers, Alexbot, Clayt85, Addbot, Obersachsebot, FrescoBot, WATerian, Citation bot 1, I dream of horses, RoadTrain, 564dude, Triple5, ZéroBot, AhMedRMaaty, ZacharySmith89, Jimw338, TLawsonB, Monkbot, Vijay kolli and Anonymous: 25

7.2 Images

- **File:Interactive_icon.svg** *Source:* https://upload.wikimedia.org/wikipedia/commons/e/e6/Interactive_icon.svg *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Thomas Shafee

7.3 Content license

- Creative Commons Attribution-Share Alike 3.0