

Understanding the Role of Insulin in the Human Body

2023 HI Family Conference, Philadelphia

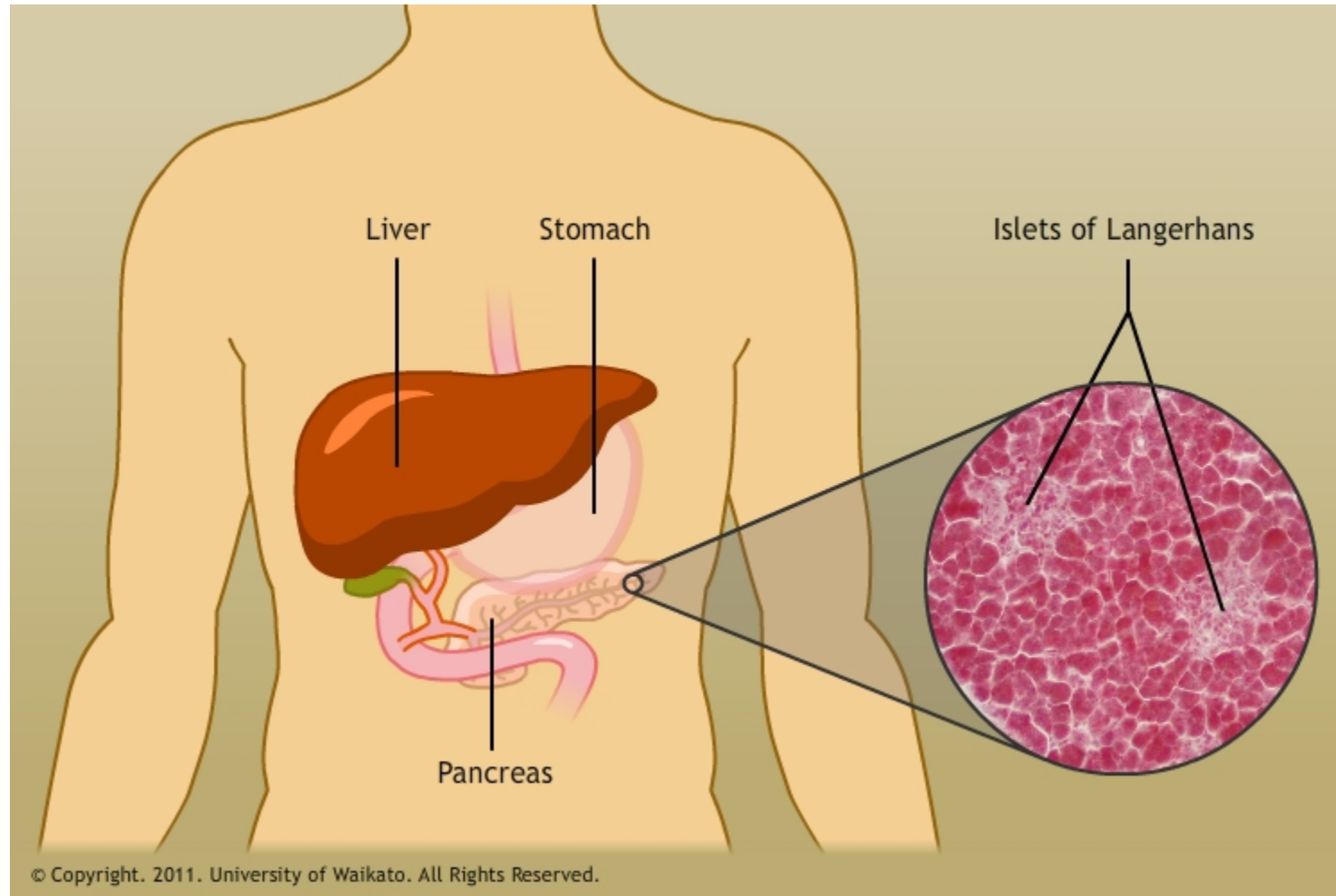
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Nothing to disclose
Thanks to NIH for funding our work

What is insulin?

The name “insulin” was derived from the Latin word for “island” because it was made by small patches of islet-like tissues in the pancreas known as the islets of Langerhans.



Discovery of Insulin



Charles Best

Frederick Banting



James Macleod

Best

Banting

James Collip

Insulin doesn't belong to me, it belongs to the world.

1921-discovered insulin using dogs

1922-14-yr-old boy Leonard Thompson with diabetes, near death, first person to receive insulin

1923-Nobel prize in Physiology and Medicine awarded to Frederick Banting and John Macleod

Sims et al., Nature Medicine, 2021, PMID: 34267380

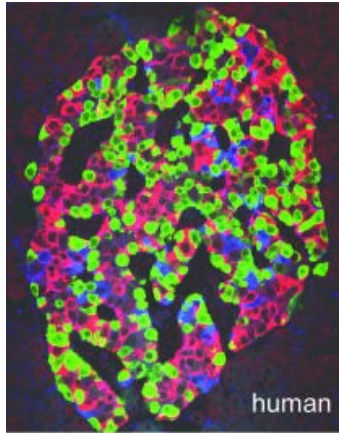
Diem et al., Diabetes Epidemiology and Management

Vecchio et al, Front Endocrinol, 2018, PMID: 30405529

<https://www.fda.gov/about-fda/fda-history-exhibits/100-years-insulin>

Insulin and blood glucose

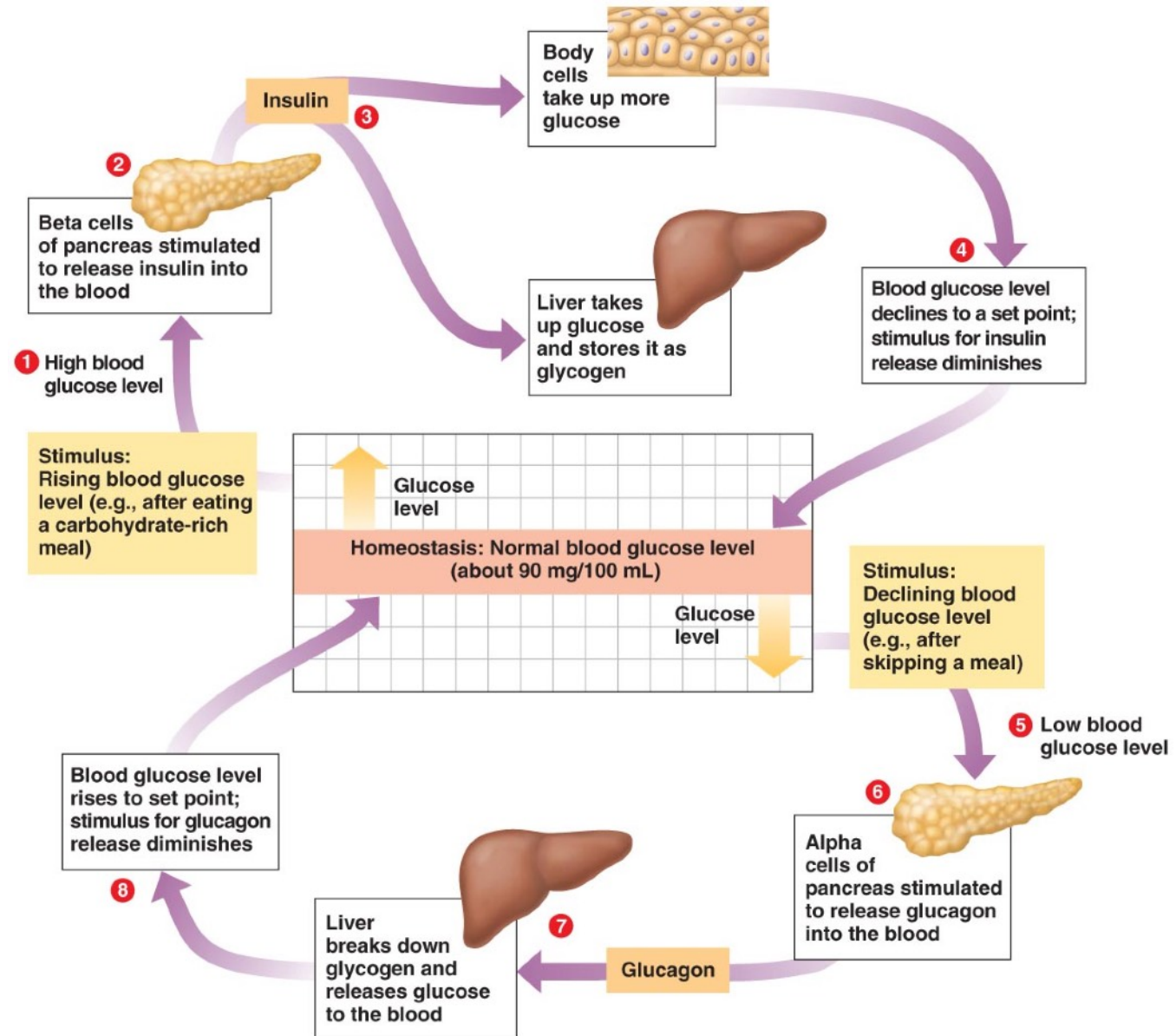
Islet of Langerhans



β cells: insulin

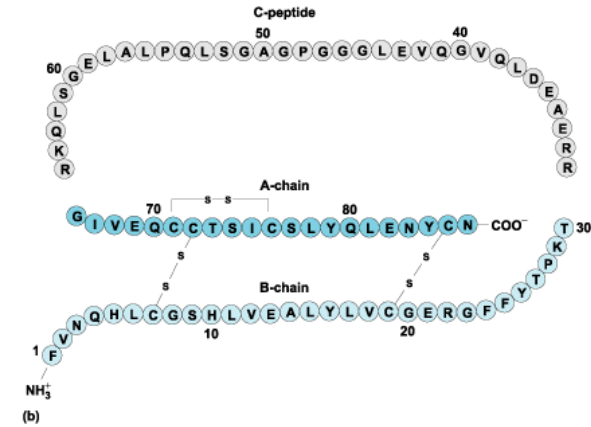
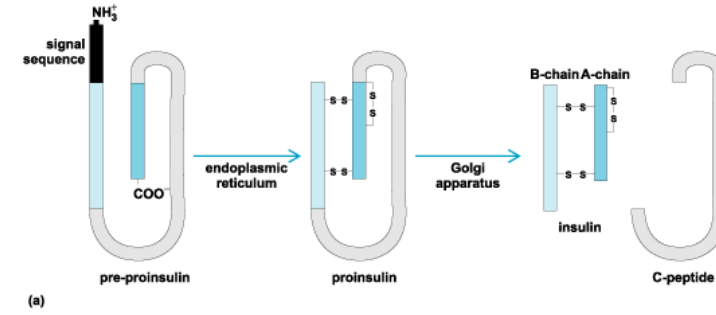
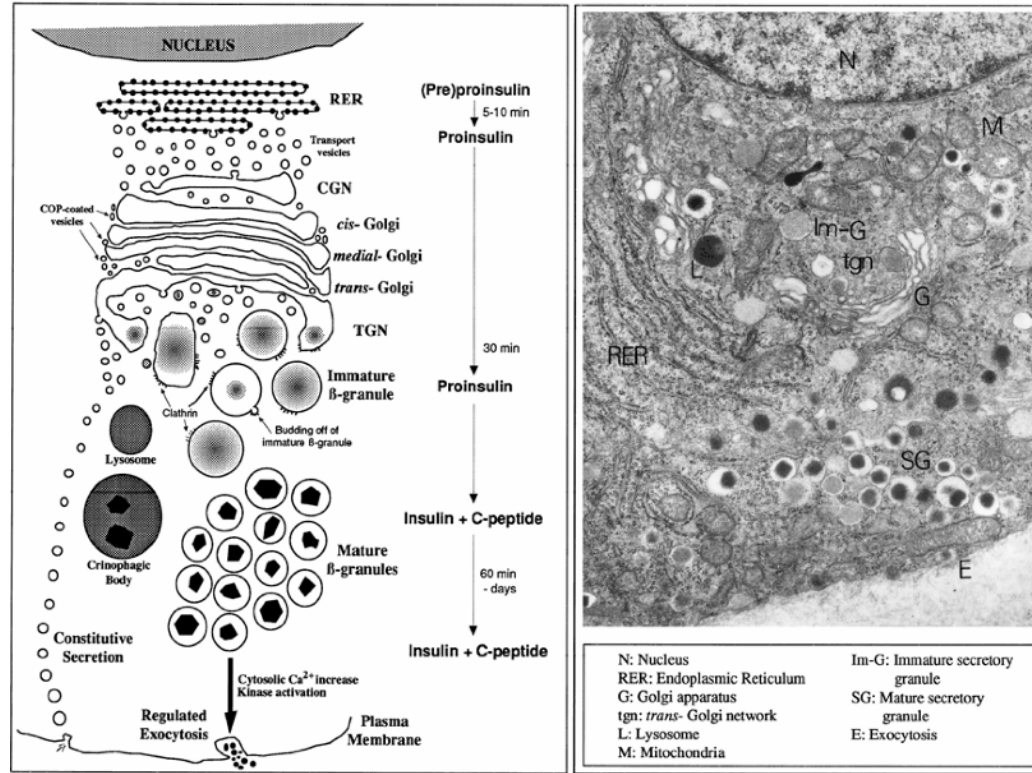
α cells: glucagon

Cabrera et al, PNAS, 2006
PMID: 16461897

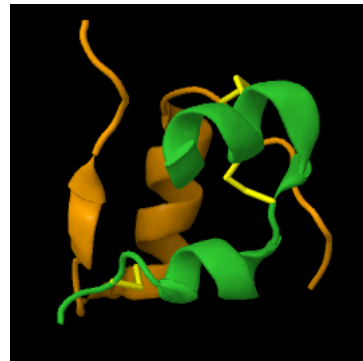


Insulin biosynthesis

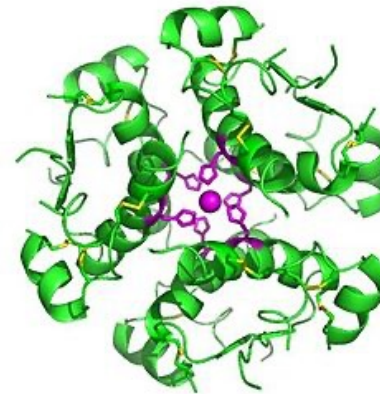
β-cell



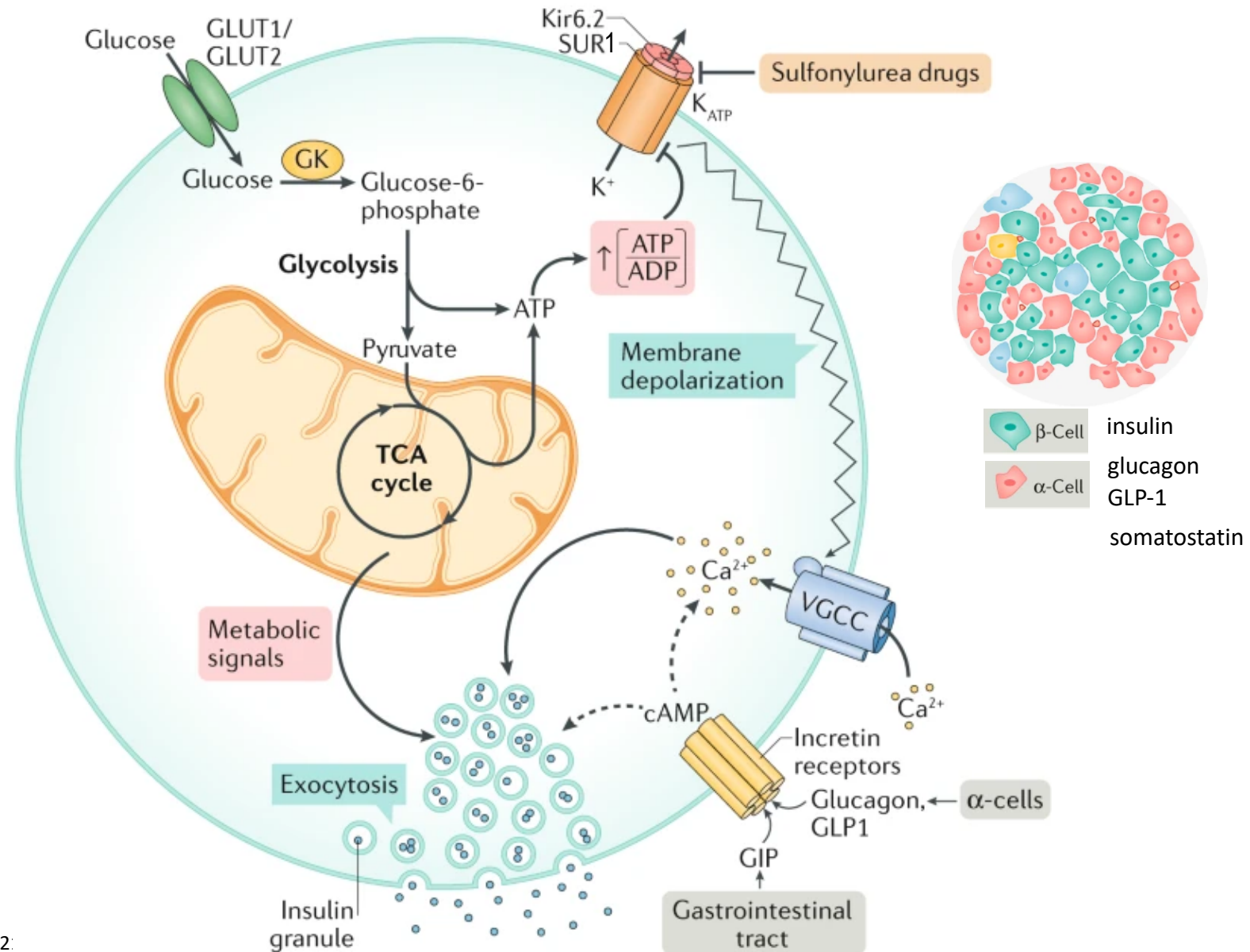
insulin monomer



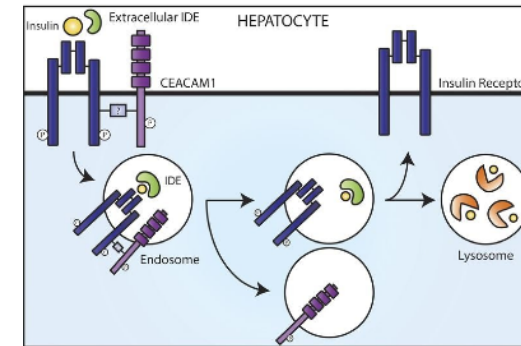
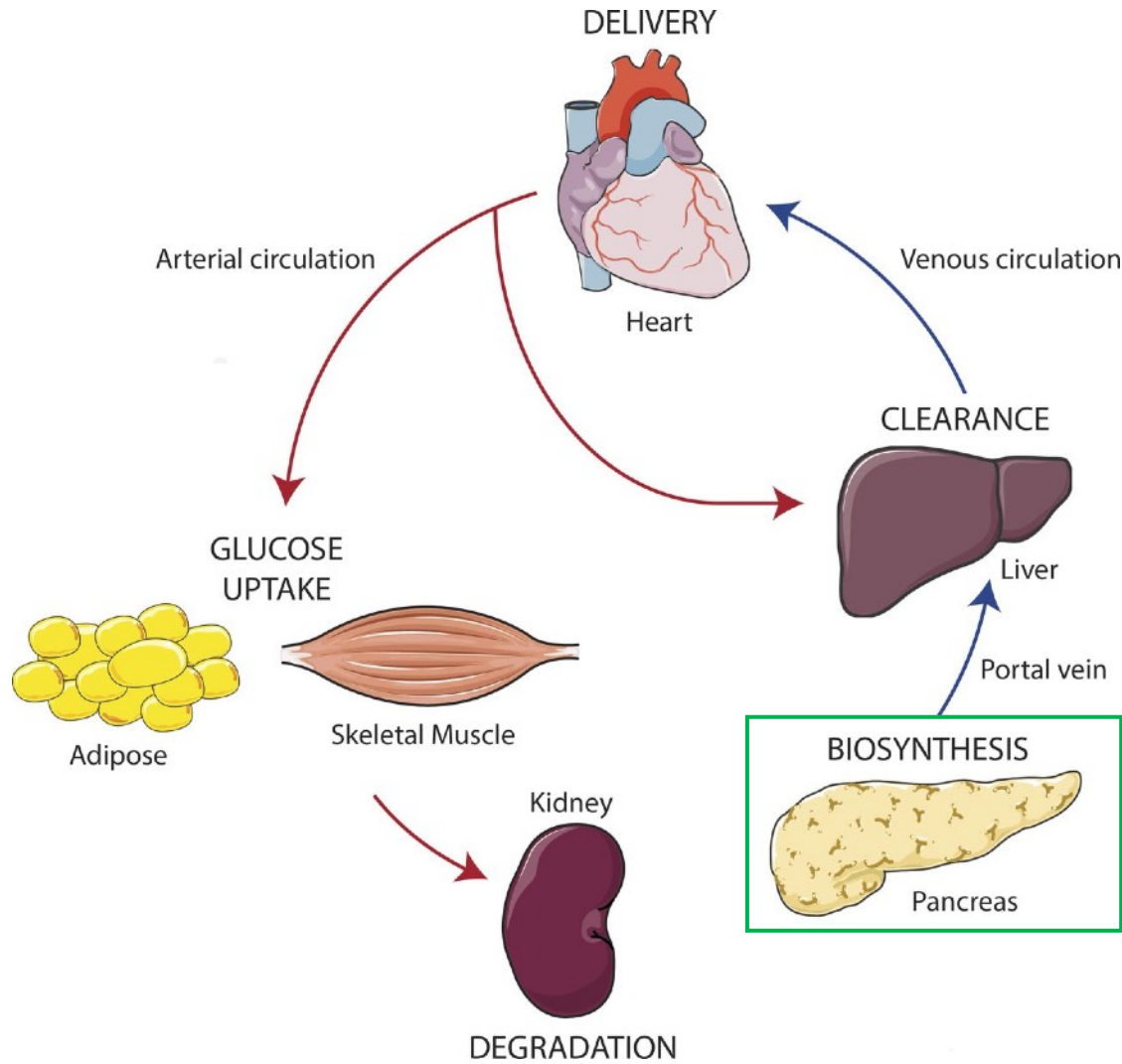
insulin hexamer



Regulation of insulin secretion from pancreatic β -cells



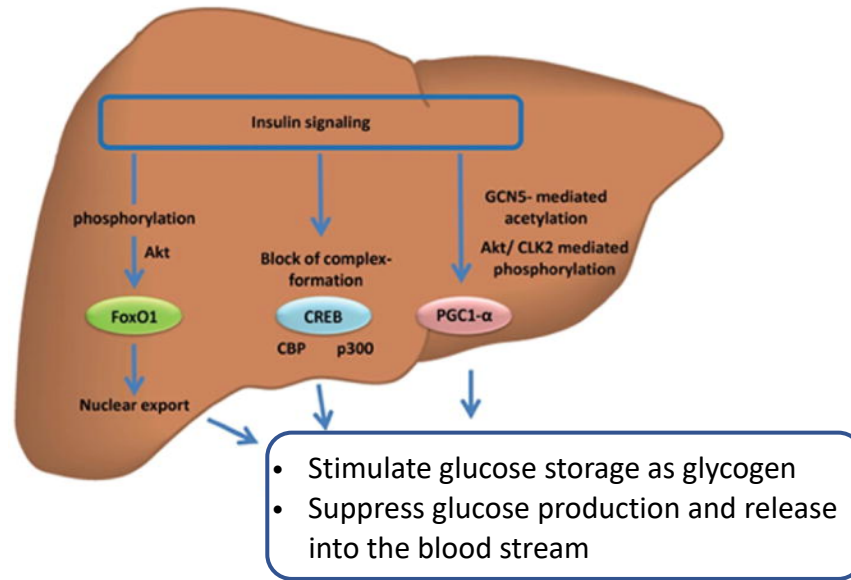
The journey of insulin in the body



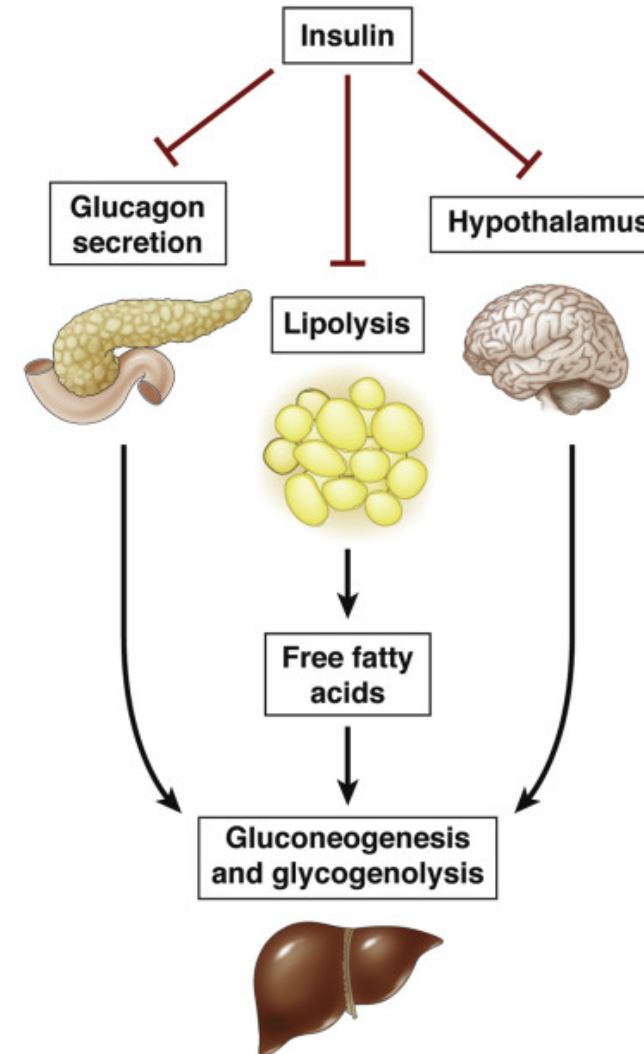
Could defects in insulin clearance in the liver contribute to CHI?
Loss of CEACAM1 or insulin degrading enzymes has been reported to cause Hyperinsulinism in mice

Insulin suppresses glucose production in the liver

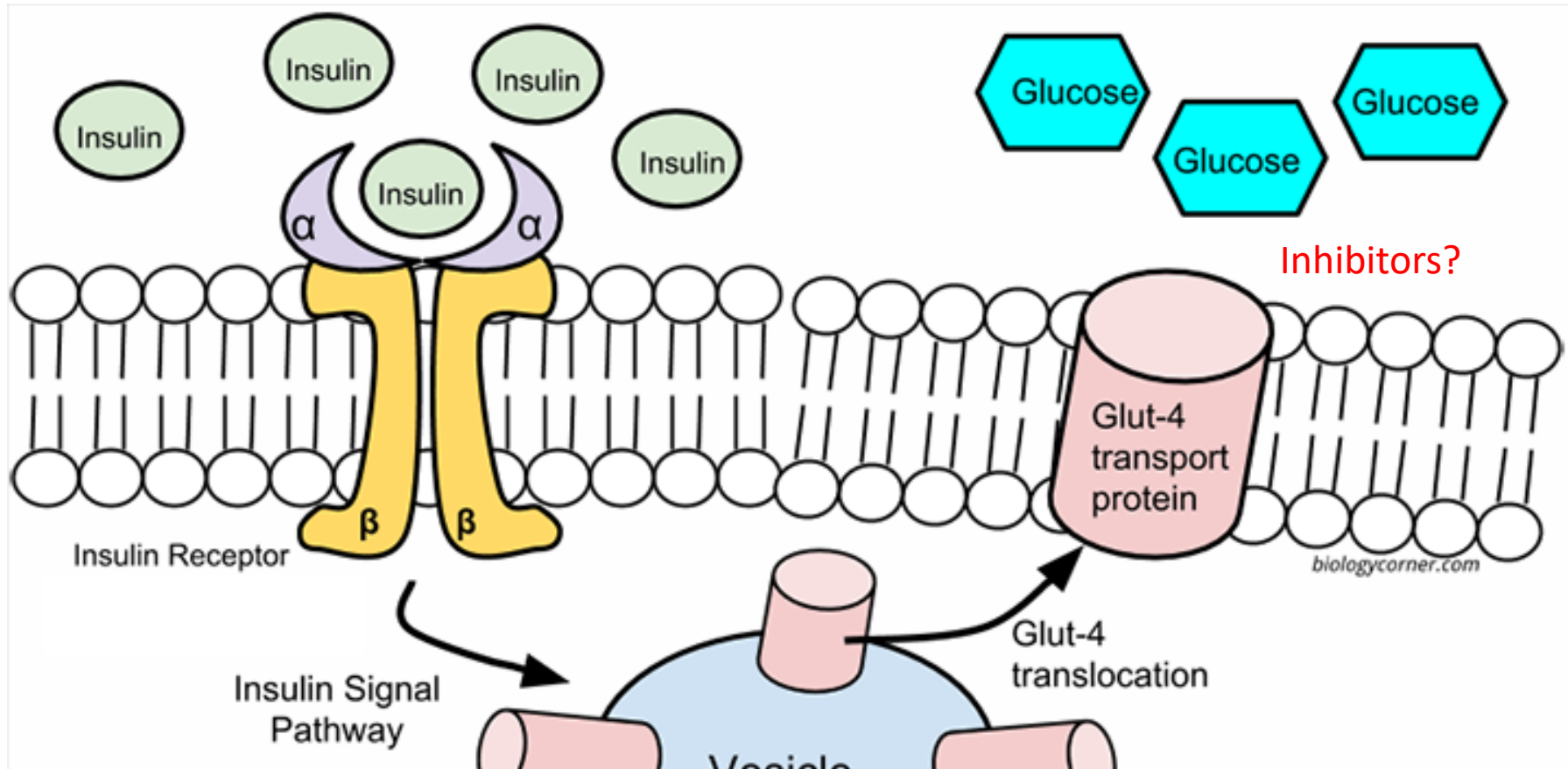
Direct effect



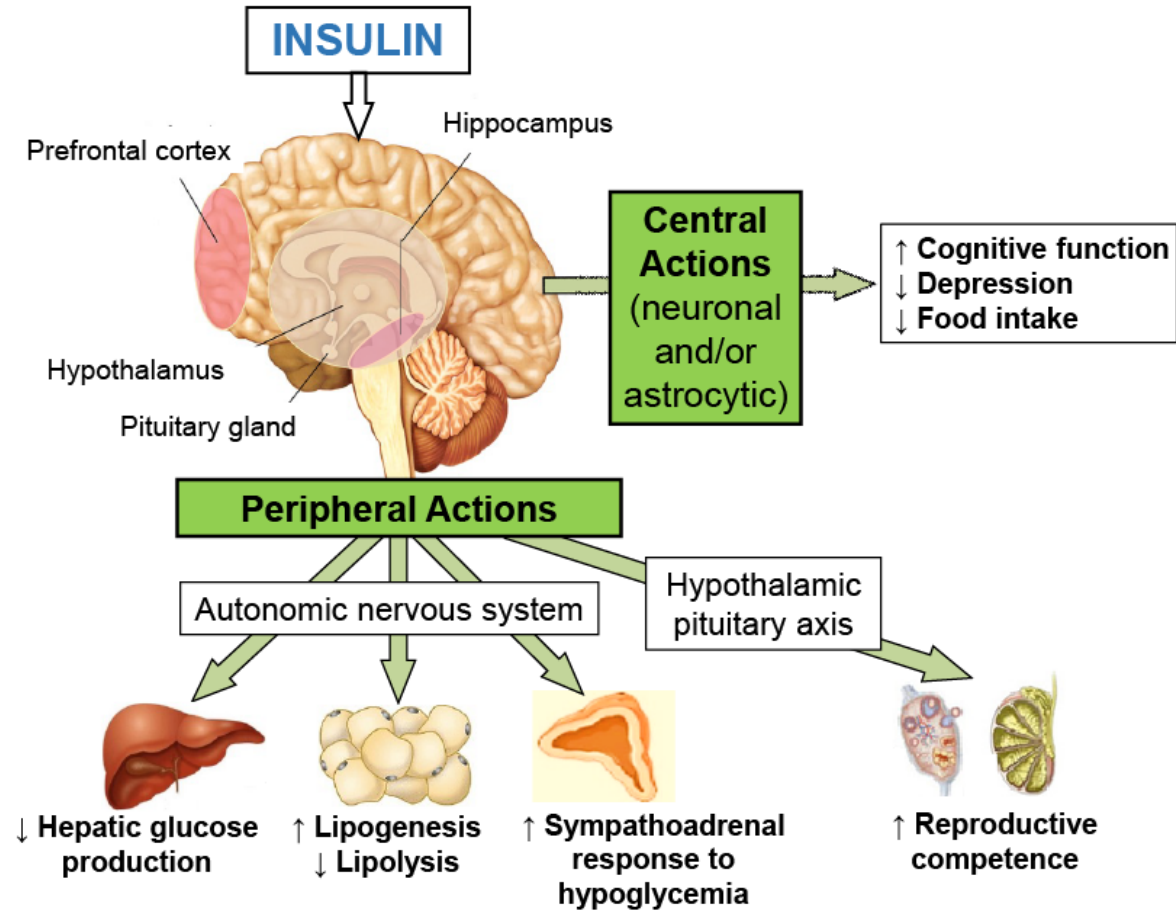
Indirect effect



Insulin increases glucose uptake in muscle and fat cells



Insulin actions in the brain



HI: Too much of a good thing

