

EXOCRINE AND ENDOCRINE PANCREAS

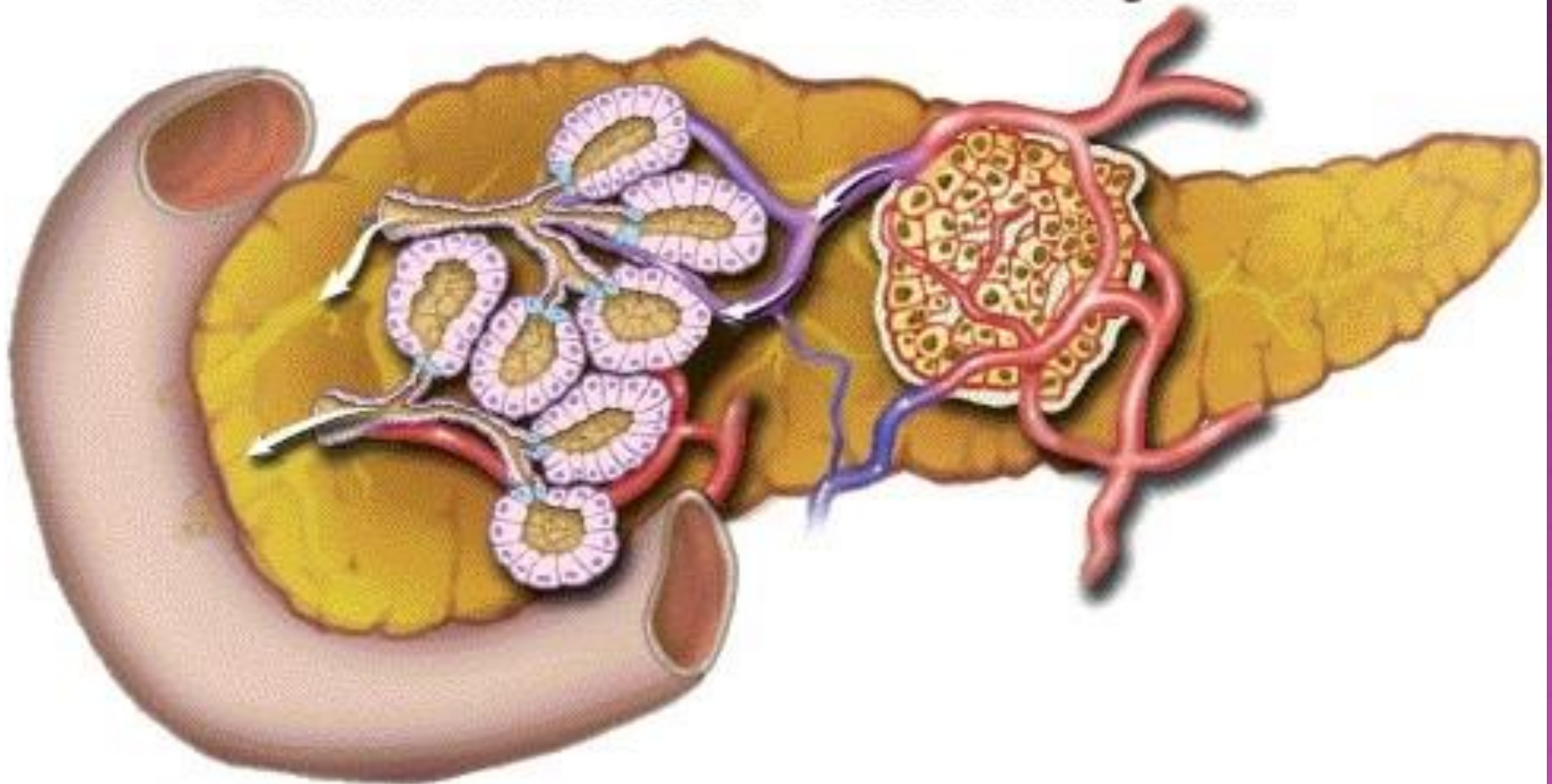
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PANCREAS

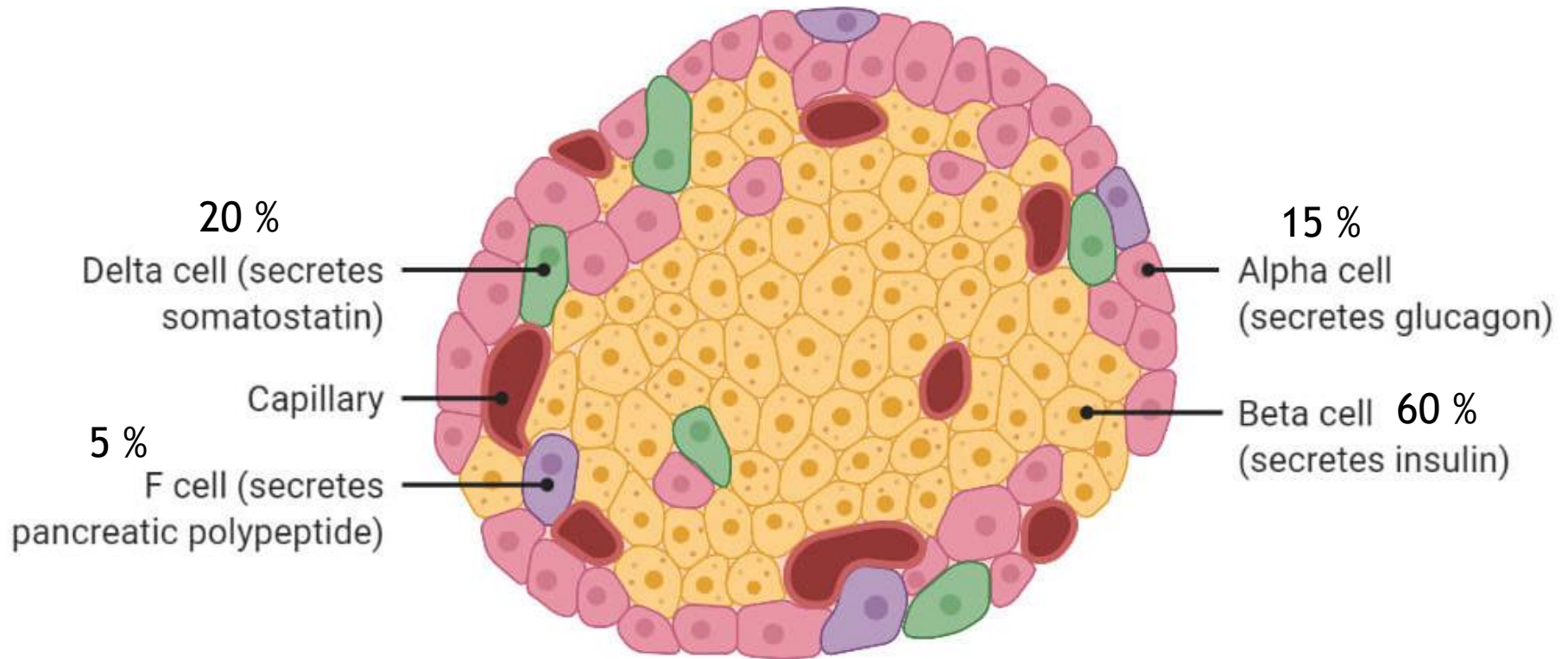
- ◉ is an organ of the digestive system and endocrine system
- ◉ in humans, location: in the abdomen behind the stomach
- ◉ **heterocrine gland = with both, an endocrine (1%) and a exocrine (digestive, 99%) function**
- ◉ **As endocrine gland, its main role is:**
 - ◉ To regulate blood sugar levels
 - ◉ Secret hormones:
 - Insulin ,
 - glucagon,
 - somatostatin,
 - pancreatic polypeptide.
- ◉ **Exocrine functions:**
 - Secretion of **pancreatic juice** into the duodenum through the pancreatic duct.

PANCREAS

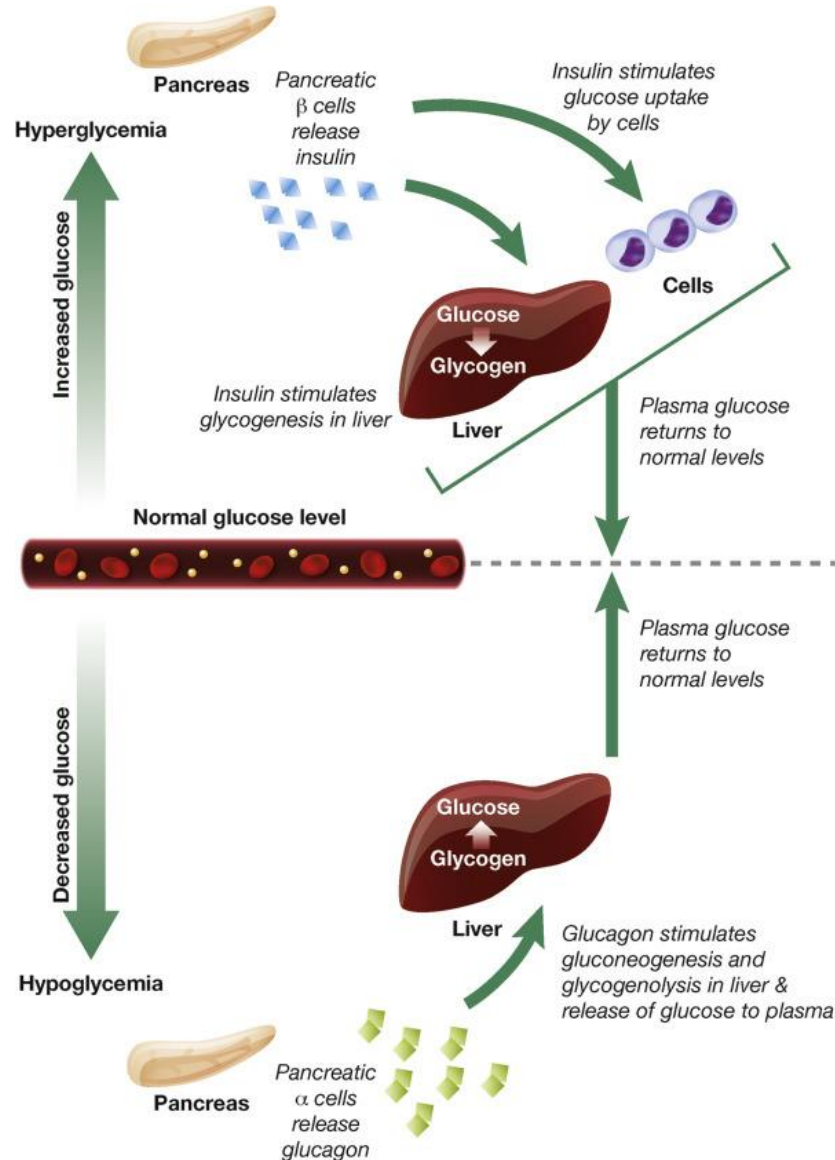
Exocrine	Endocrine
Acinar and duct tissue	Islets of Langerhans



ENDOCRINE PANCREAS



Islet of Langerhans



⊙ ↓ blood glucose - A cells secrete glucagon → blood glucose ↑

⊙ ↑ blood glucose - B cells secrete insulin → blood glucose ↓

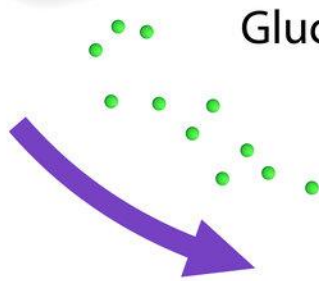
GLUCAGON

- ◉ production: A cells of the pancreas
- ◉ it raises concentration of glucose and fatty acids in the bloodstream
- ◉ a main catabolic hormone in the body
- ◉ ↓ blood glucose stimulates its production
- ◉ glucagon - stimulates glycogenolysis in the liver

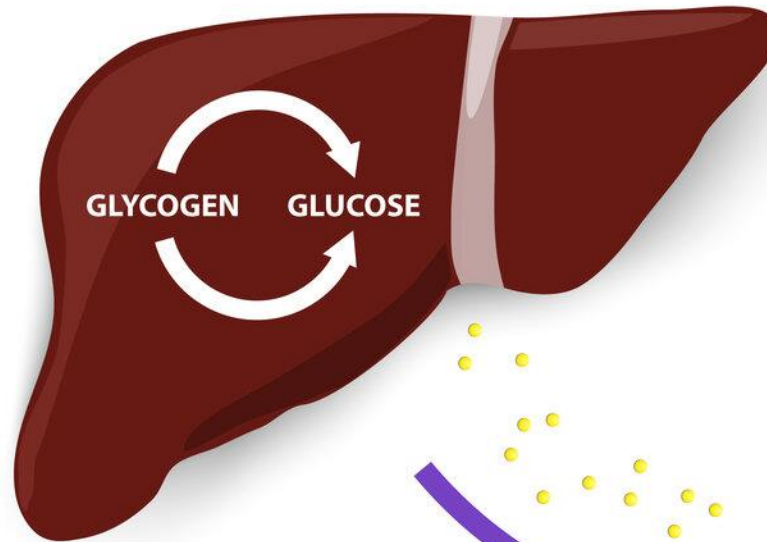
PANCREAS



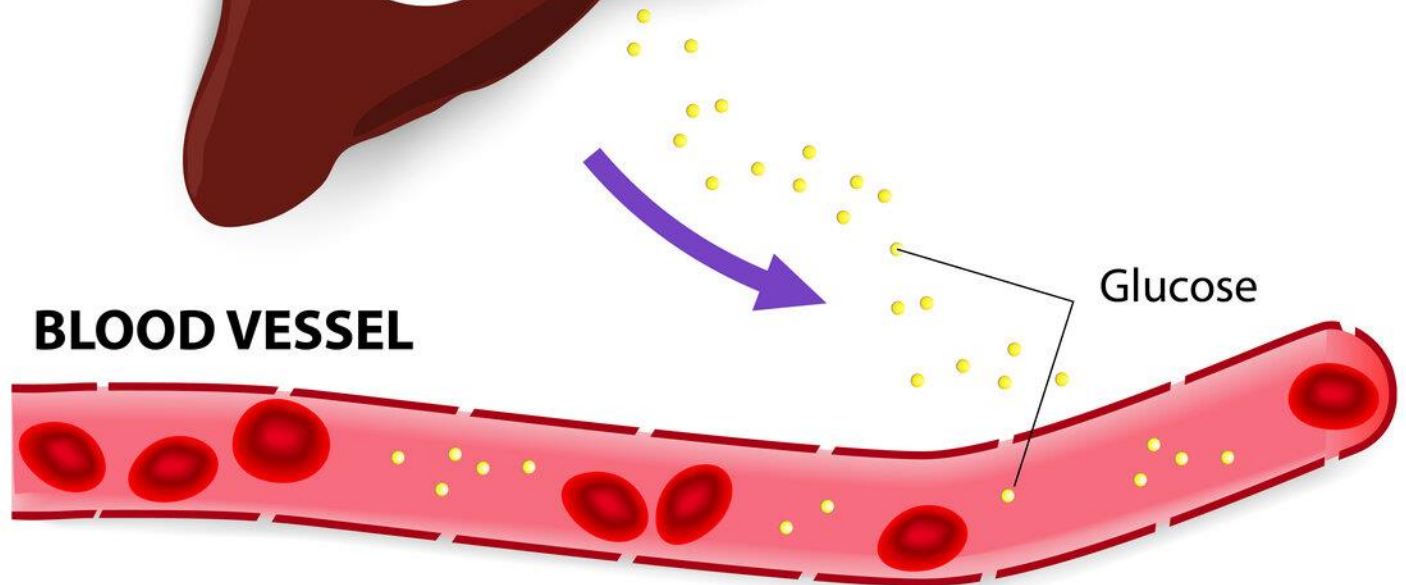
Glucagon



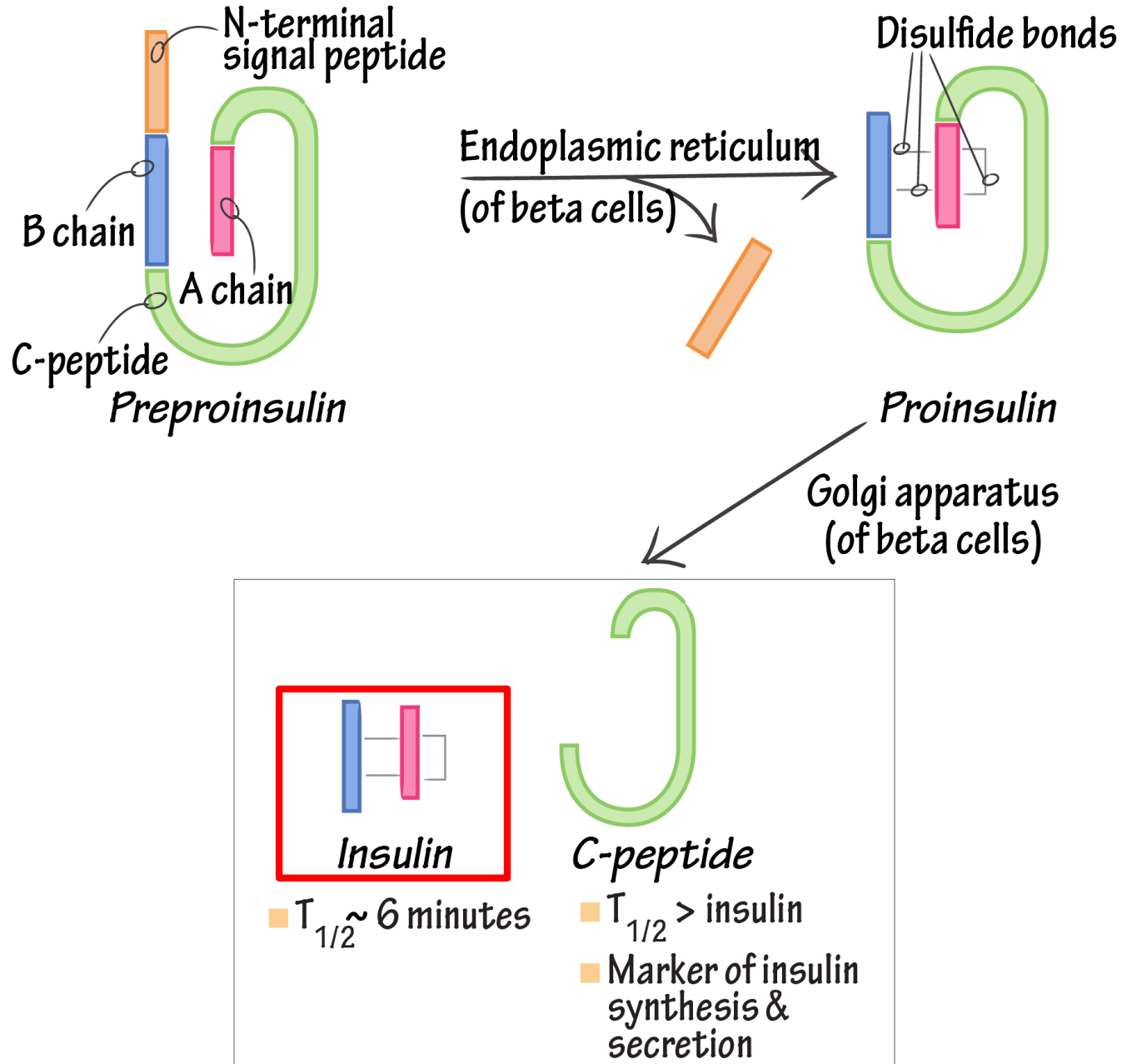
LIVER



BLOOD VESSEL

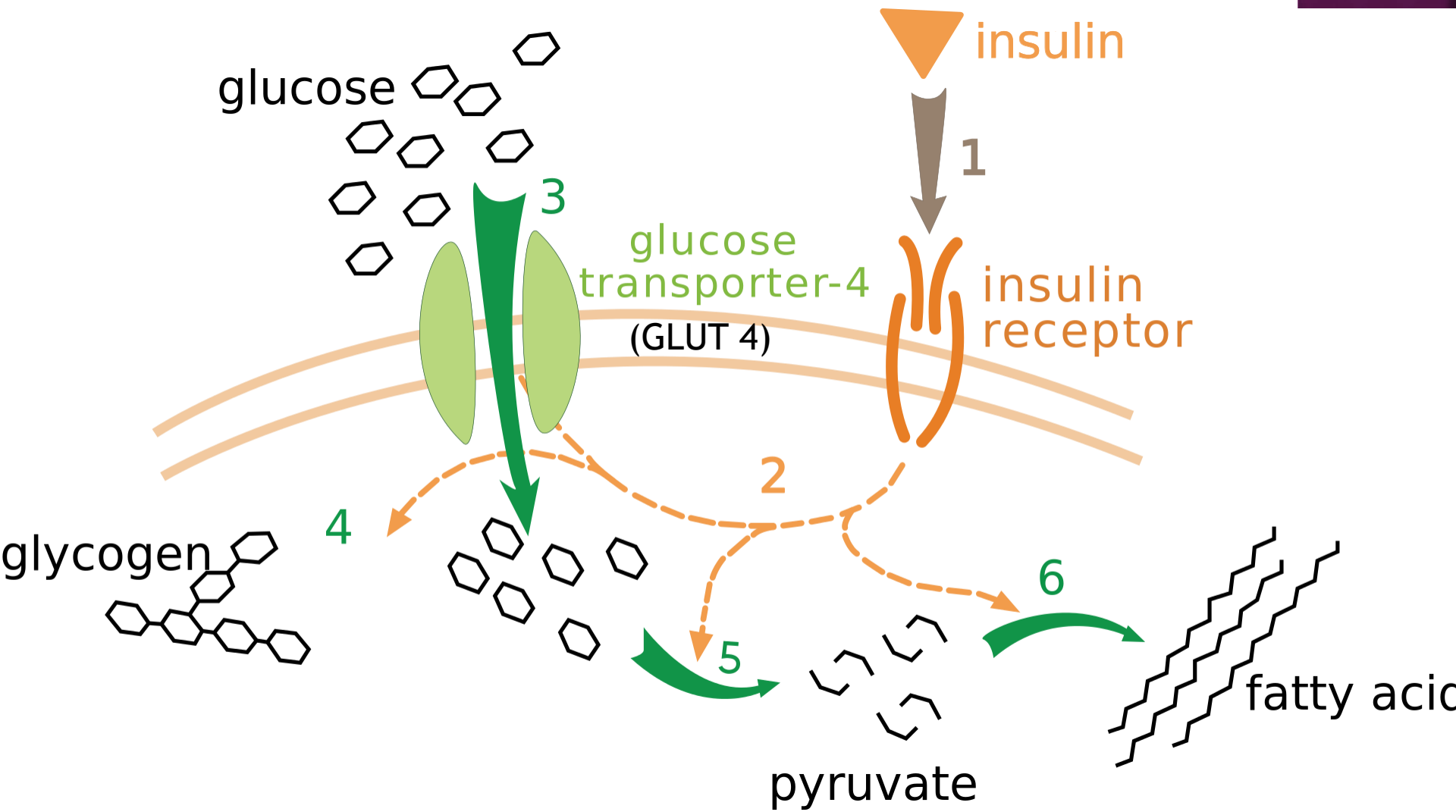


Insulin Structure



INSULIN - REGULATION OF BLOOD GLUCOSE

- ◉ Stimulates the uptake of glucose - GLUT4 transporter in the cell membranes (muscle and fat tissues)
- ◉ Increased fat synthesis - triglycerides
- ◉ Increased esterification of fatty acids - triglycerides from fatty acids
- ◉ Decreased lipolysis - reduction in conversion of fat cell lipid stores into blood fatty acids and glycerol
- ◉ Induce glycogen synthesis:
 - **hexokinase enzyme** (adding a phosphate group in glucose - a molecule that cannot exit the cell)
 - insulin inhibits the enzyme **glucose-6-phosphatase** - removing the phosphate group
 - insulin activates: **phosphofructokinase and glycogen synthase** - glycogen synthesis
- ◉ Decreased gluconeogenesis and glycogenolysis



SOMATOSTATIN AND PANCREATIC POLYPEPTIDE

- ◉ **Somatostatin:**

- inhibits insulin and glucagon secretion.

- ◉ **Pancreatic polypeptide:**

- inhibits somatostatin secretion

INSULINOMA

- ⊙ a tumor of the pancreas that is derived from **beta cells**
- ⊙ **it secretes insulin**
- ⊙ mainly benign tumors (,,only,, in pancreas)
- ⊙ the secretion of insulin by insulinomas is not properly regulated by glucose - the tumors continue to secrete insulin causing **hypoglycemia**

INSULINOMA - SYMPTOMS

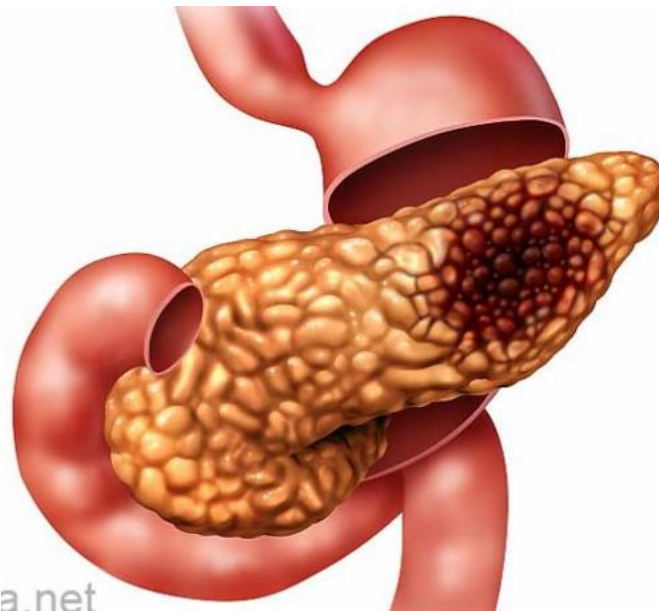
○ Mild symptoms:

- double vision or blurred vision
- confusion
- anxiety and irritability
- dizziness
- mood swings
- weakness
- sweating
- hunger
- tremors
- sudden weight gain

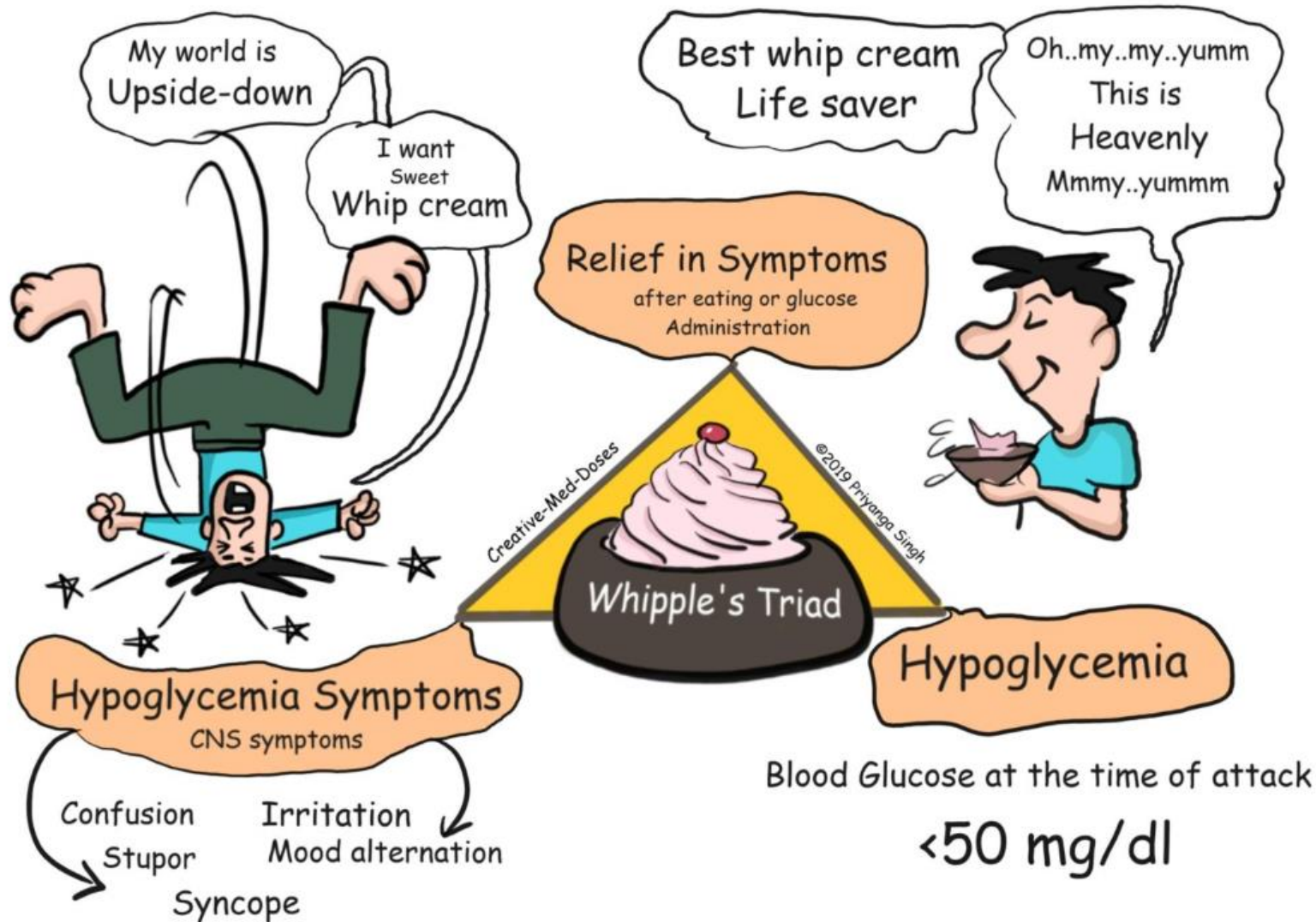
○ Severe symptoms:

- convulsions or seizures
- a rapid heart rate (greater than 95 beats per minute)
- difficulty concentrating
- loss of consciousness or coma

Treatment: surgical removal of the insulinoma

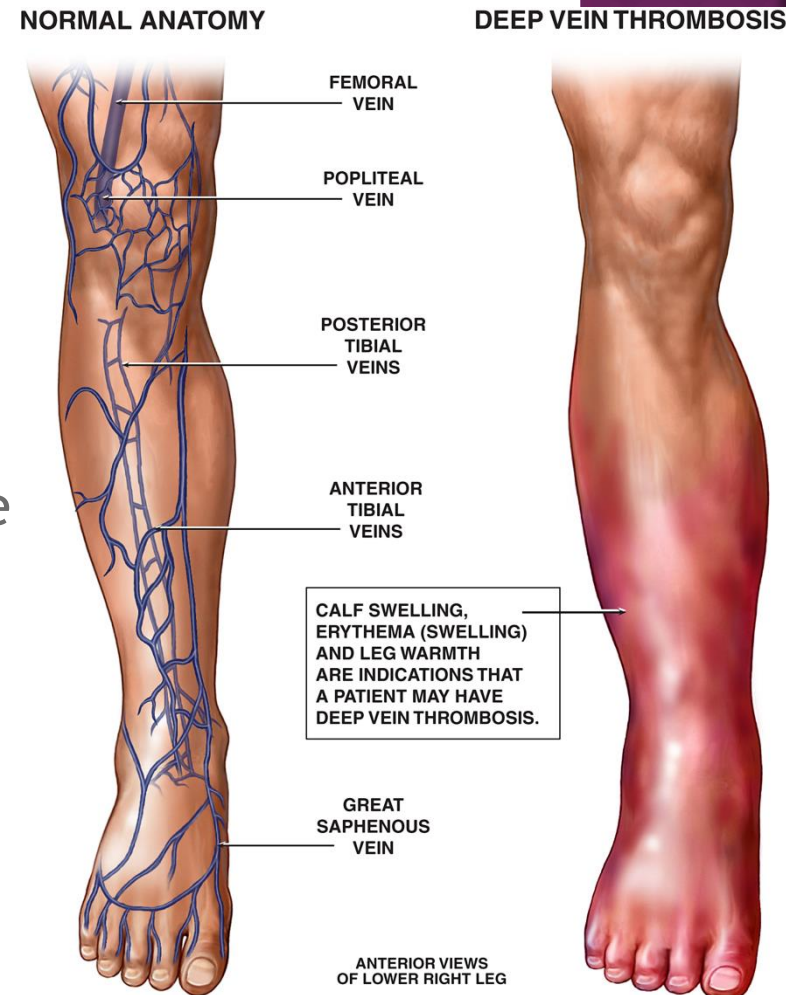


Remember Whipple triad by this picture of whip cream and its relation to sugar



GLUCAGONOMA

- ◉ a tumor of the pancreas that is derived from **alfa cells**
- ◉ it secretes glucagon - **hyperglycemia**
- ◉ Diabetes-like symptoms:
 - high blood sugar
 - excessive thirst and hunger due to high blood sugar
 - frequently waking up at night to urinate
 - diarrhea
 - a skin rash, or dermatitis (face, belly etc.) - crusty or filled with pus
 - unintentional weight loss
 - blood clots in the legs = deep vein thrombosis



GLUCAGONOMA - TREATMENT

- ◉ Surgery is the only way
- ◉ The type of surgery you have depends on:
 - the size of the tumour,
 - where it is,
 - whether it has spread to other parts of the body such as the liver.
- ◉ Somatostatin