PANCREAS GLAND

SEM – II, CC-IV

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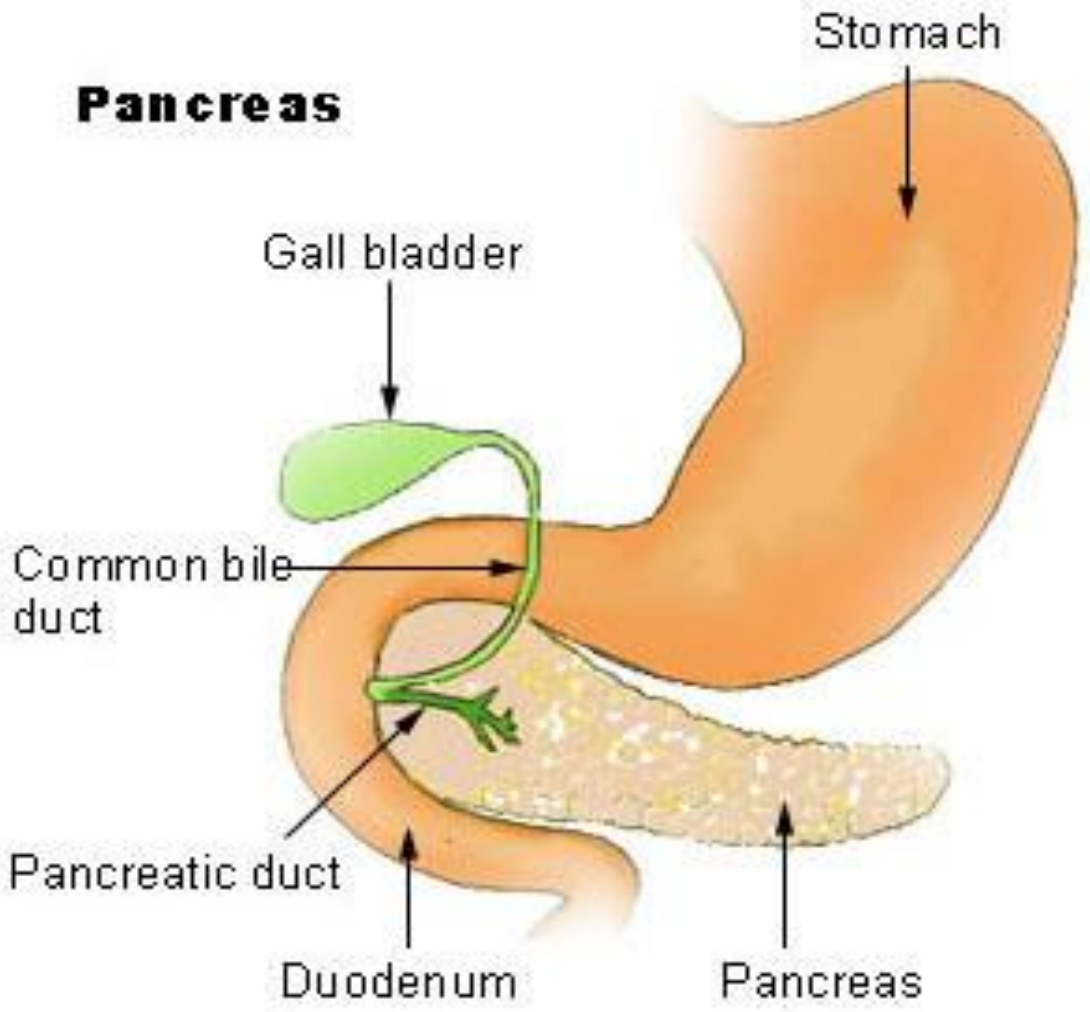
The Pancreas

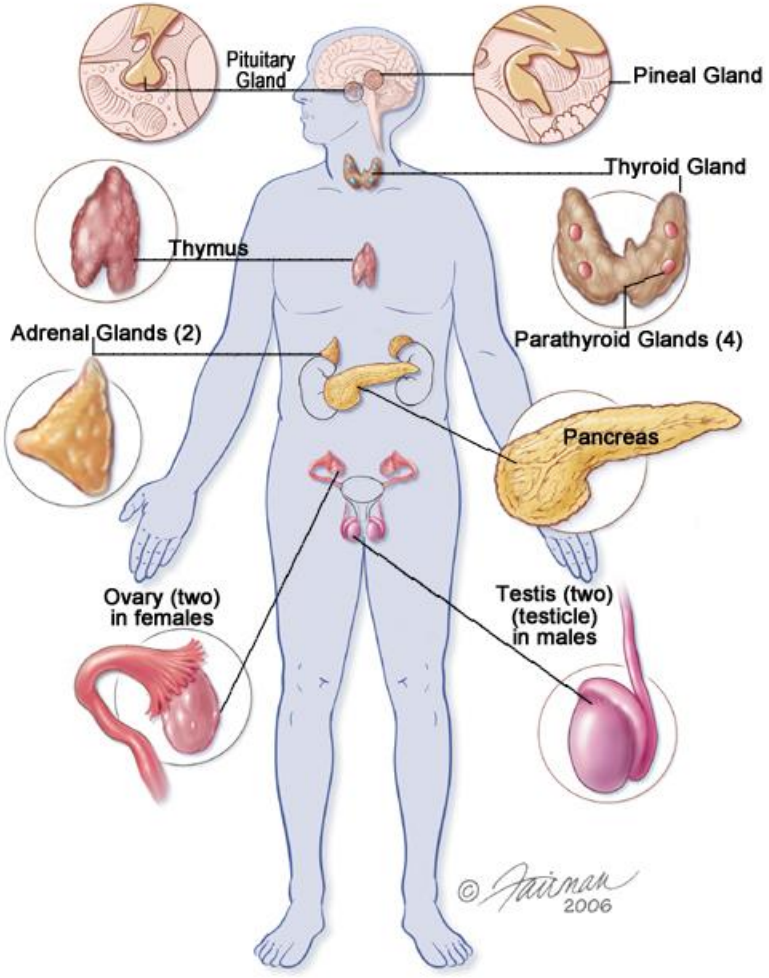
The pancreas is located behind the stomach, and under the Gall Bladder.

It's purpose is to maintain homeostasis in the blood sugar level of the body.



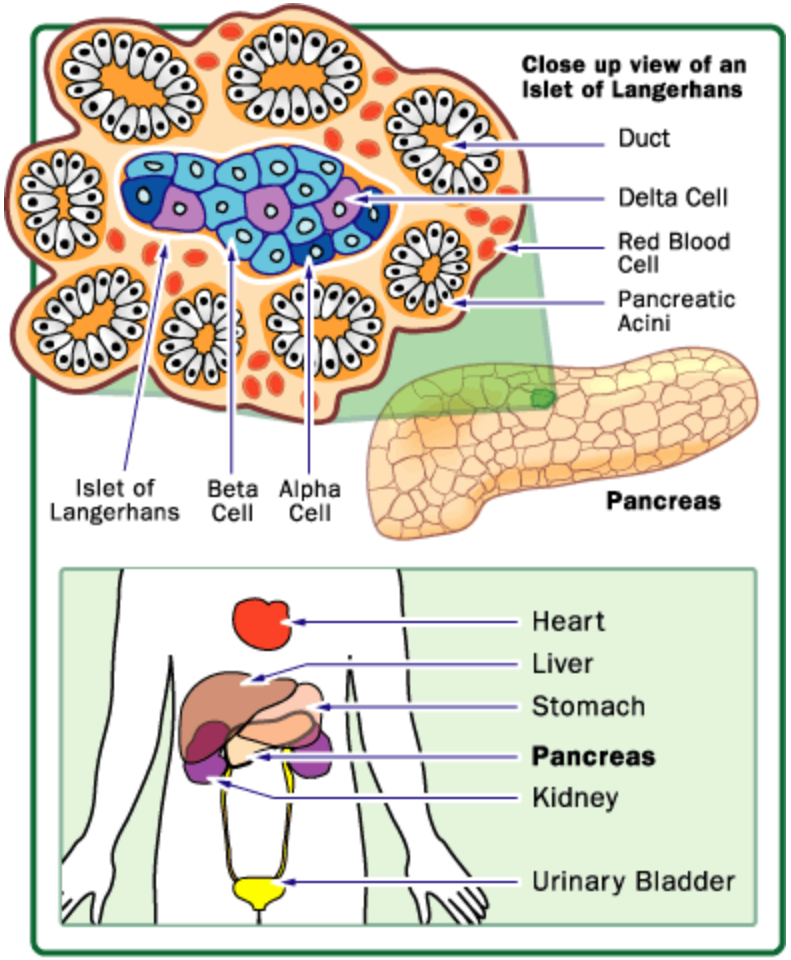
What is and Endocrine Gland?

- An endocrine gland produces and secretes hormones directly into the bloodstream.



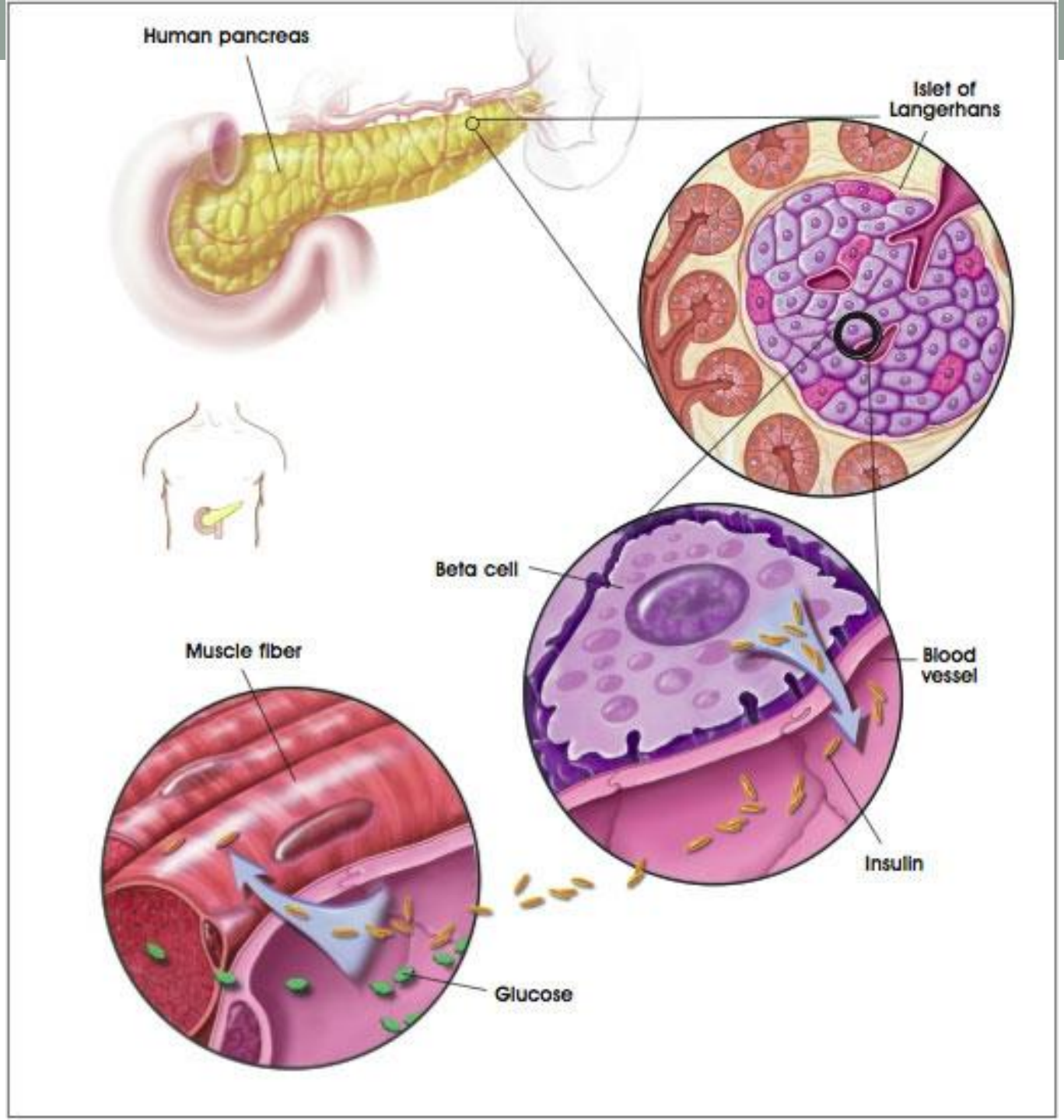
How does the Pancreas act as an Endocrine Gland?

- About 5% of the pancreas is made up of endocrine cells; the remainder is part of the digestive system, producing digestive enzymes that are secreted into the intestines to assist in the digestion of food.
- These endocrine cells are arranged in clusters throughout the pancreas.



How does the Pancreas act as an Endocrine Gland?

- Endocrine cells produce and release insulin, somatostatin, and glucagon.
- Small blood vessels surround each cluster of endocrine cells, in order for hormones produced by the cells to be absorbed directly into the bloodstream.


Human pancreas
Islet of Langerhans
Beta cell
Blood vessel
Muscle fiber
Insulin
Glucose

Hormones of the Pancreas

bulk of the pancreas is an exocrine gland secreting

Endocrine pancreas

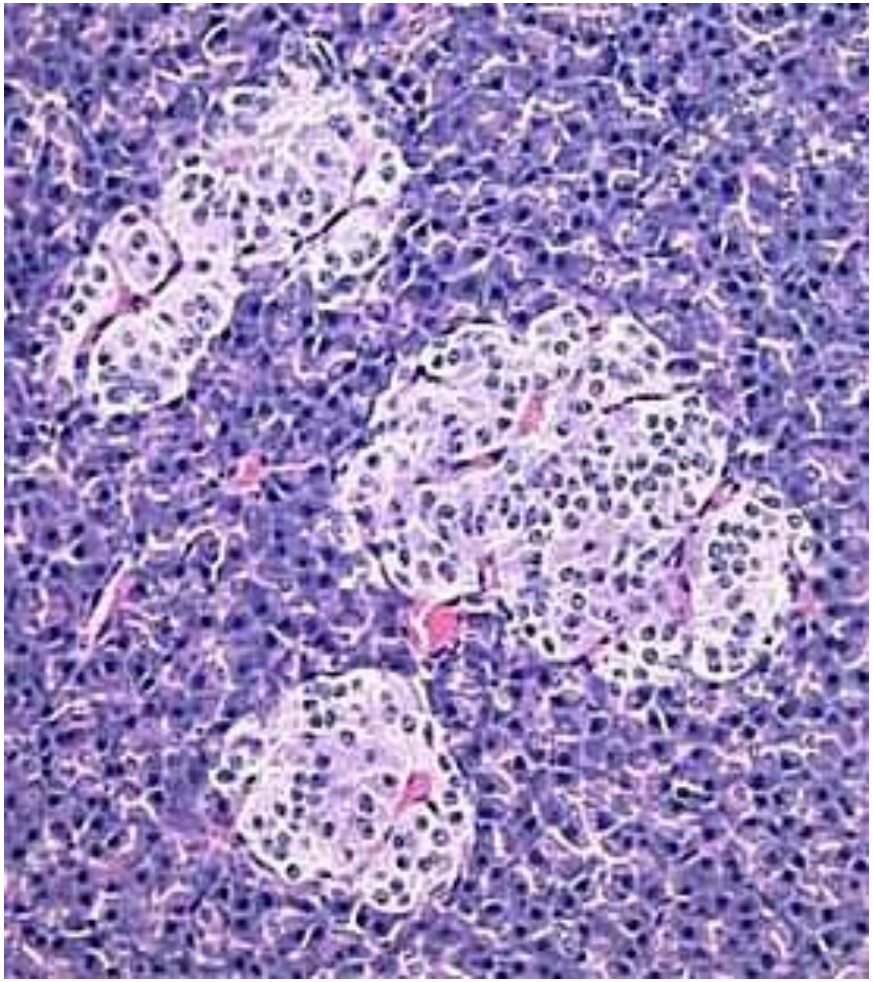
Scattered through the pancreas are several hundred thousand clusters of cells called islets of Langerhans.

The islets are endocrine tissue containing 4 types of cells.
In order of abundance, they are the:
β cells-secrete insulin and amylin;
α cells- secrete glucagon;
δ cells-secrete somatostatin
γ cells-secrete a polypeptide of unknown function.
(36 aa and plays a role in food intake)

The endocrine portion of the pancreas takes the form of many small clusters of cells called islets of Langerhans or, more simply, islets.

Humans have roughly one million islets.

In standard histological sections of the pancreas, islets are seen as relatively pale-staining groups of cells embedded in a sea of darker-staining exocrine tissue. The image to the right shows 3 islets



Interestingly, the different cell types within an islet are not randomly distributed –

beta cells occupy the central portion of the islet and are surrounded by a "rind" of α and δ cells.

Aside from the insulin, glucagon and somatostatin, a number of other "minor" hormones have been identified as products of pancreatic

Hormones of the Pancreas

The pancreas produces three hormones from the endocrine gland:

Insulin:

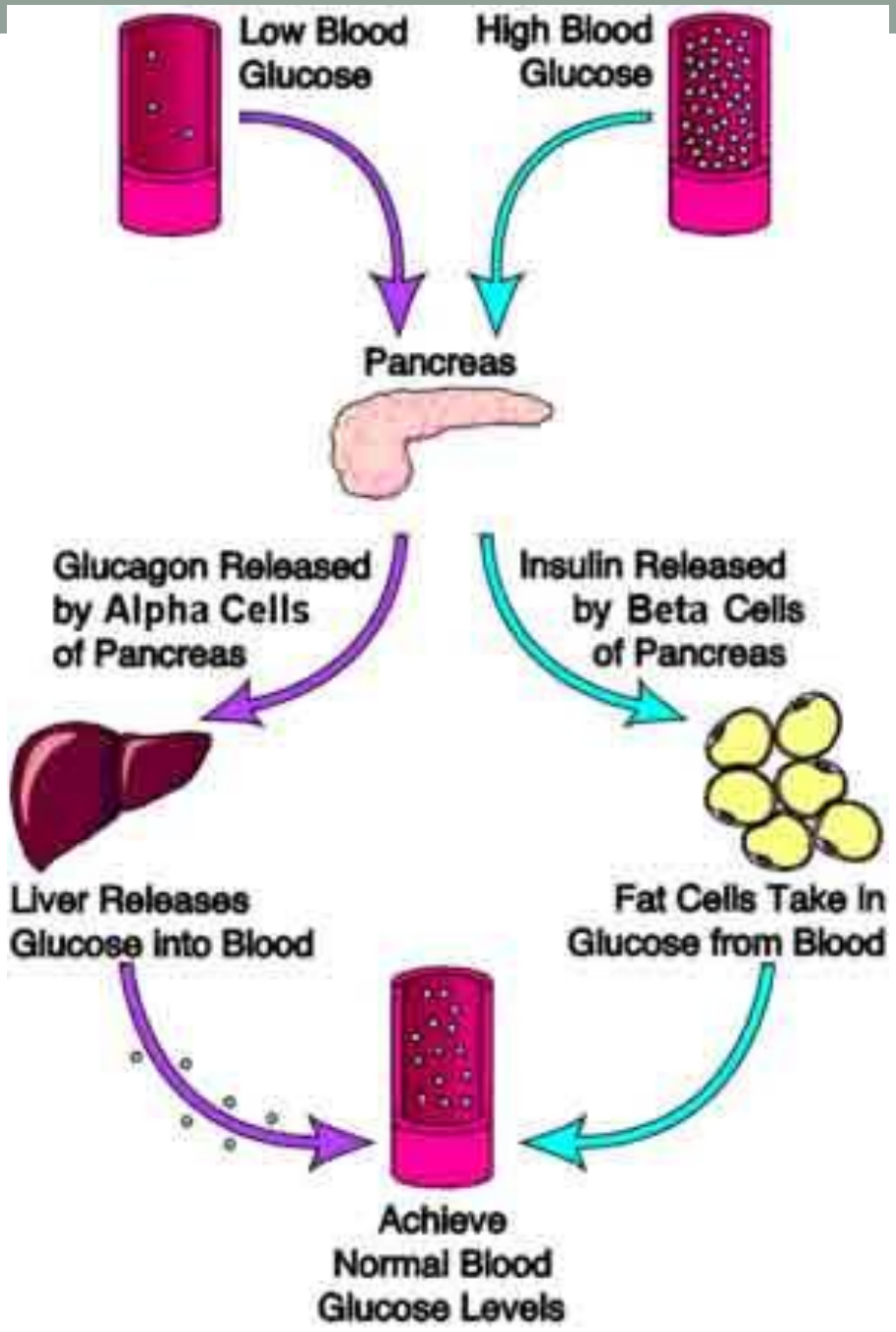
- Insulin is a protein
- When there is a detected increase of sugar in the body, the pancreas secretes insulin.
- Insulin allows cells to absorb glucose from the blood stream to the inside of the cell.

Glucagon

- Glucagon is the opposite of insulin
- When there is low blood sugar, glucagon is secreted
- It forces cells to release or create glucose, increasing the blood glucose level
- When there is high blood sugar, the secretion of glucagon is inhibited

Somatostatin

- Somatostatin regulates the production of other hormones
- When there are low levels or high levels of other hormones, it is activated


Low Blood Glucose
High Blood Glucose
Pancreas
Glucagon Released by Alpha Cells of Pancreas
Insulin Released by Beta Cells of Pancreas
Liver Releases Glucose into Blood
Fat Cells Take In Glucose from Blood
Achieve Normal Blood Glucose Levels

Diabetes

- Diabetes is a condition in which the body cannot properly store and use fuel (Glucose) for energy.
- The pancreas produces insulin, which allows the cells to recognize and use glucose – in a person with diabetes, either the pancreas makes no insulin, or can not use the insulin it makes

How does the Pancreas Act as a Homeostatic Mechanism?

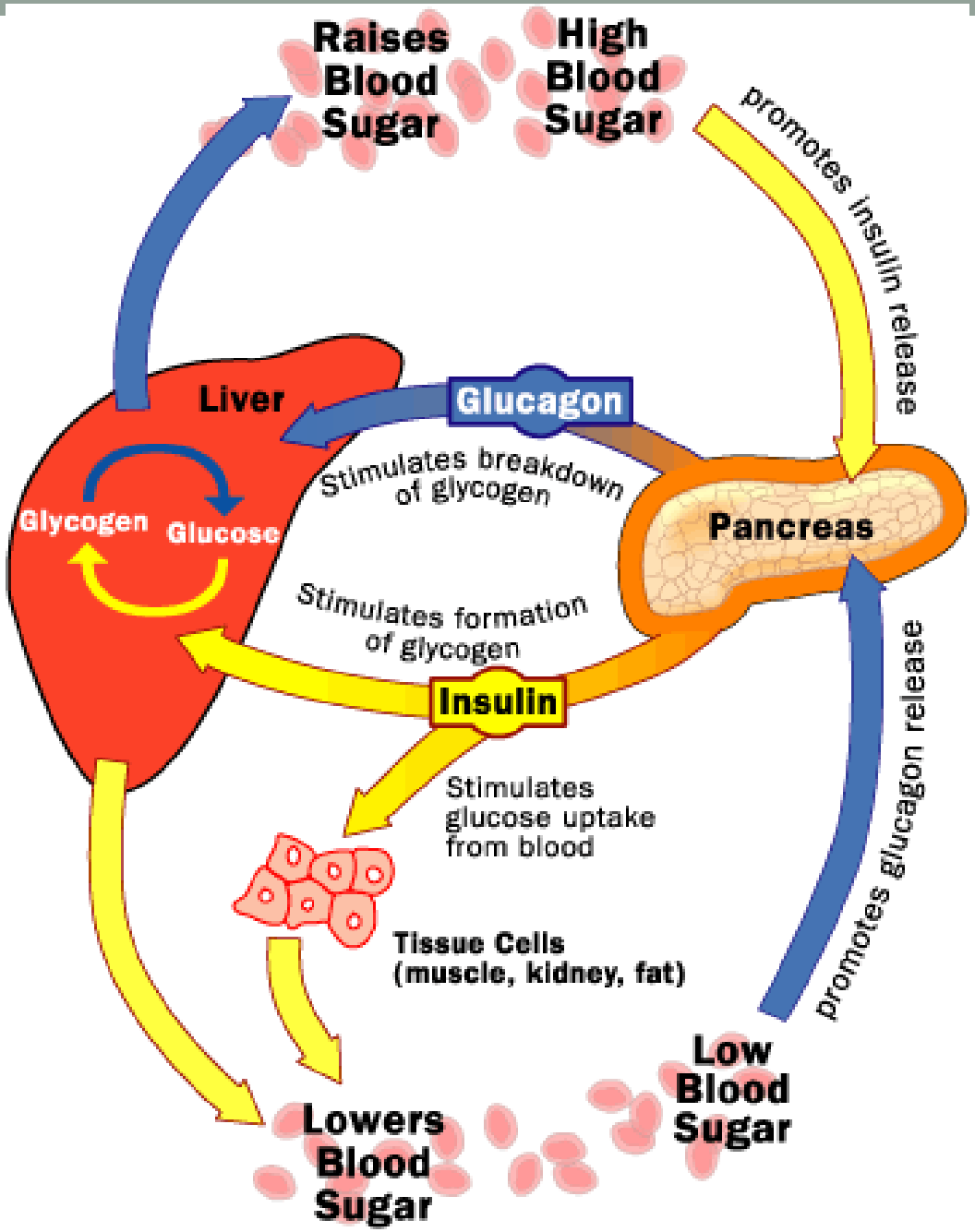
- Our bodies must keep a constant supply of glucose in the bloodstream at all times.
- If we were unable to do this, we would have more than enough glucose after meals, and starve between them.
- To keep homeostasis of the glucose levels in our bloodstream, the pancreas releases hormones into the bloodstream.

How does the Pancreas Act as a Homeostatic Mechanism?

- -Insulin production is stimulated by the presence of glucose, fatty acids, and amino acids in the body's intestines.
- The insulin causes cells of the muscles, the liver, and other organs to become permeable to the glucose.
- -This allows glucose to pass into the muscles, liver, and other organs; where it is stored in the form of glycogen.
- -Insulin also stimulates fat cells to form fats from fatty acids and glycerol.
- -Insulin is also a key factor in protein production, as it stimulates liver and muscle cells to use amino acids to synthesize proteins.
- -Finally, insulin inhibits the liver and kidney cells from making glucose from intermediate compounds of

How does the Pancreas Act as a Homeostatic Mechanism?

- -The opposite effect can be seen when the body goes without food for a period of time, and glucose levels in the bloodstream decrease.
- -The alpha cells secrete a hormone called glucagon.
- -The slight drop in glucose levels in the blood will also inhibit insulin production.
- -Glucagon stimulates the liver and muscles to break down stored glycogen and release the glucose into the bloodstream for absorption by cells.
- -Glucagon also stimulates gluconeogenesis in the liver and kidneys
- With the production and release of glucagon, and the inhibition of insulin, glucose concentrations in the body's bloodstream rise.


Raises Blood Sugar
High Blood Sugar
promotes insulin release
Liver
Glucagon
Stimulates breakdown of glycogen
Glycogen
Glucose
Pancreas
Stimulates formation of glycogen
Insulin
Stimulates glucose uptake from blood
Tissue Cells (muscle, kidney, fat)
promotes glucagon release
Low Blood Sugar
Lowers Blood Sugar