The Pancreas and Blood Sugar

I see many people today with “sugar handling” symptoms. This means the body does not handle the “glucose” it needs to get into the cells for energy properly. It could be the patient does not take in enough good sugar, or insulin which takes the sugar into the cell is not working properly, or the cell membrane has become damaged and does not allow the insulin in the cell to be used. **Symptoms include:** getting hungry when we shouldn’t, we do not feel fulfilled after we eat, we feel our brain needs a sweet after eating to enable us to feel right and think, we get shaky or even mean when we do not get enough to eat or that the time we need our food. These problems get worse and worse and maybe we get diabetes and these causes inflammation throughout our body, neuropathy and heart disease.

The pancreas, is at the center of handling our sugar handling as it reacts to help digest and absorb our food for energy and provides insulin to take the sugar into the cells. The pancreas is both an exocrine gland and an endocrine gland. The exocrine portion produces pancreatic juice that is carried to the stomach and small intestine. The pancreatic juice consists of an aqueous component that contains sodium, potassium, and bicarbonate ions and an enzymatic component that contains digestive enzymes (hepatic lipase, amylase, and protease) that are important in the breakdown of lipids, protein, and carbohydrates. The exocrine portion of the pancreas is under hormonal and neural control. For example, cholecystokinin stimulates the release of bile from the gall bladder and digestive enzymes from the pancreas. Parasympathetic stimulation through the vagus nerves also stimulates pancreatic juice secretions. Sympathetic stimulation inhibits pancreatic juice secretion which could cause a decrease in digestion, increase indigestion, and cause GERD. Stress increases this sympathetic stimulation which means stress=digestion problems.

The endocrine portion of the pancreas produces hormones that are released into the circulatory system. The hormones are produced by specific cell types in the pancreas: alpha cells – glucagon, beta cells – insulin, and delta cells – somatostatin. The autonomic nervous system innervates these cells to release their hormones based on the body’s needs. The parasympathetic nervous system is associated with food intake and acts on the pancreas to increase insulin secretion. As blood glucose concentration rises, the pancreas secretes insulin to decrease the concentration of blood sugar and store the glucose in the cells. Insulin promotes cell uptake of glucose and also promotes the synthesis of glycogen which is the storage form of glucose inside cells. The sympathetic nervous system inhibits insulin secretion to maintain blood glucose levels during periods of physical activity and excitement. When blood sugar levels are too low, the pancreas can also secrete glucagon which increases the release of glucose from cells and promotes the reaction gluconeogenesis in order to produce more glucose.
About the Pancreas and sugar handling problems

The pancreas is not the only organ that maintains blood glucose levels. Many endocrine organs and hormones play a vital role in the homeostasis of blood sugar concentration. Some other organs that are important are the hypothalamus, pituitary, and the adrenal glands. The hypothalamus and the pituitary stimulate the release of hormones that act on different tissues of the body that can affect blood sugar maintenance. In times of stress, the pituitary stimulates ACTH which will act on the adrenal glands to produce cortisol and epinephrine. Both of these hormones will cause an increase in blood sugar. Growth hormone is another example of a hormone that plays a role in sugar maintenance. Growth hormone will also increase blood concentrations of sugar. Many different hormones are responsible for the glucose levels in an individual. If any of these hormones are distributed unevenly, an imbalance of glucose might partake. The body might be able to normalize blood sugar levels by increasing the output of another hormone. This could lead to exhaustion of the secondary organ and could cause long term consequences. It is important for every organ to support the body properly. Glucose is maintained endogenously however a lot of glucose can come from an outside source like food.

Glucose is obtained through eating carbohydrates and is maintained through the functioning of the body's endocrine system. The digestion of carbohydrates starts in the mouth with the enzyme amylase that is present in saliva. Then the food goes to the stomach and then released into the small intestines. The small intestine is where most of the carbohydrate digestion takes place. The pancreatic juices are carried to the stomach and small intestine where the starchy carbohydrates are broken down by the enzyme amylase into maltose or sucrose. The maltose and sucrose are then absorbed into the lining of the intestine and get further converted in glucose. Once the carbohydrates are converted into glucose, the sugar gets absorbed into the bloodstream. Then glucose travels to different tissues in the body where it can be stored or used as energy.

Glucose is the main source of energy for the brain. The nerves and the brain depend on normal sugar levels to function properly. Diabetics have shown to be at an increased risk for mild cognitive impairment and Alzheimer's disease due to hyperglycemia. Recent studies have shown that people with diabetes are 1.5 times more likely to develop cognitive decline than people without diabetes. The ongoing Memory in Diabetes study show that a 1 percent increase in A1C levels corresponded to slightly lower scores on psychomotor speed, cognitive function, memory, and multiple task management. This study supports the idea that the brain's chronic exposure to elevated blood glucose levels may be one explanation for memory and cognitive decline in the elderly and diabetics. There are a couple theories of why high blood sugar could cause impaired mental function. One theory is that high levels of blood sugar over a period of time may cause direct damage to nerve cells due to the accumulations of certain end-products. Nerve damage may also result indirectly by damage to blood vessels in the brain due to atherosclerosis. Another theory states that elevated blood sugar reduces
the volume of the hippocampus. The hippocampus plays an important role in memory and spatial navigation. The hippocampus is also one of the first regions of the brain to suffer damage in people with Alzheimer's disease.

Some pancreatic disorders can have psychiatric presentations. Hypoglycemia can cause people to become disoriented, confused, and even hallucinate. If a person has continuous states of hypoglycemia, then they can have persistent cognitive impairment which could mimic psychiatric disorders. The brain cannot store glucose, so the brain gets its energy supply through the bloodstream. Also a prolonged period of hyperglycemia could affect the brain. As mentioned previously, diabetic patients have a faster decline in mental function compared to healthy individuals.

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click here for What To Do For “Sugar Handling” Problems