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Opinion Article

Glucose Levels in Monogenic Diabetic Patients and their Metabolism

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DESCRIPTION

Monogenic diabetes is a rare type of diabetes that is caused by a single gene mutation. Unlike the more common types of diabetes, such as type 1 and type 2, which are influenced by multiple genes and environmental factors, monogenic diabetes is inherited from one or both parents or develops spontaneously. Monogenic diabetes accounts for about 1 to 4 percent of all cases of diabetes and usually affects young people. There are two main forms of monogenic diabetes: Neonatal Diabetes Mellitus (NDM) and Maturity-Onset Diabetes of the Young (MODY). NDM occurs in newborns and infants and is characterized by high blood glucose levels within the first 6 months of life. MODY is more common than NDM and occurs in adolescents and young adults. It is characterized by mild to moderate fasting hyperglycemia, meaning high blood glucose levels after not eating for at least 8 hours.

Fasting glucose is an important indicator of the body's ability to regulate glucose levels. Glucose is the main source of energy for the cells and tissues of the body. It is derived from the food we eat and is transported by the blood to various organs. Insulin, a hormone produced by the pancreas, helps the cells to use glucose for energy or store it for later use. When there is not enough insulin or the cells are resistant to its action, glucose accumulates in the blood, leading to hyperglycemia. Normal fasting glucose levels in healthy people are between 70 mg/dL (3.9 mmol/L) and 100 mg/dL (5.6 mmol/L). Fasting glucose levels above 100 mg/dL (5.6 mmol/L) may indicate prediabetes, a condition that increases the risk of developing type 2 diabetes. Fasting glucose levels above 126 mg/dL (7 mmol/L) on two separate tests may indicate diabetes.

Some forms of NDM, caused by mutations in genes such as *KCNJ11* or *ABCC8*, result in severe insulin deficiency and very high fasting glucose levels (above 200 mg/dL or 11.1 mmol/L) that require insulin injections from birth1. However, some people with these mutations may respond to oral drugs called sulfonylureas that stimulate insulin secretion from the pancreas1. Other forms of NDM, caused by mutations in genes such as *INS* or *FOXP3*, cause autoimmune destruction of the insulin-producing cells and low fasting glucose levels (below 70 mg/dL or 3.9 mmol/L) that require glucagon injections to prevent hypoglycemia.

Monogenic diabetes affects fasting glucose levels differently depending on the type and severity of the gene mutation. Some mutations impair the production or secretion of insulin by the pancreatic beta cells, resulting in low insulin levels and high glucose levels. Some mutations affect the function or regulation of insulin by altering its structure or binding to its receptor, resulting in insulin resistance and high glucose levels. Some mutations affect the development or survival of the pancreatic beta cells, resulting in reduced insulin capacity and high glucose levels. The diagnosis of monogenic diabetes requires genetic testing to identify the specific gene mutation that causes the condition. Genetic testing can also help to determine the inheritance pattern and the risk of passing on the mutation to offspring. Genetic testing can also help to differentiate monogenic diabetes from other types of diabetes that have similar symptoms but different treatments.

CONCLUSION

The treatment and management of monogenic diabetes depend on the type and severity of the gene mutation and its effect on fasting glucose levels. Some forms of monogenic diabetes can be treated with oral diabetes medications that lower blood glucose levels by stimulating insulin secretion, enhancing insulin sensitivity, or reducing glucose absorption. Some forms of monogenic diabetes require insulin injections to replace or supplement the deficient or ineffective insulin. Some forms of monogenic diabetes may improve or resolve over time without any specific treatment. It is rare but important form of diabetes that affects fasting glucose levels and requires genetic testing for diagnosis and treatment. People with monogenic diabetes need regular monitoring of their blood glucose levels and adjustment of their medication doses to achieve optimal glycemic control and prevent complications. People with monogenic diabetes also need education and support to cope with their condition and maintain a healthy lifestyle.

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