

Diabetes and You: Protecting Your Health

Glucose (or blood sugar) is the body's major source of energy for fuel. The majority of the glucose (sugar) in your blood comes from food that is eaten in two forms: complex carbohydrates and simple sugars.

What are normal glucose levels?

The normal blood sugar level in a person without diabetes is 70-100 mg/dl before eating a meal and less than 140 mg/dl two hours after eating.

How is diabetes diagnosed?

Diabetes is diagnosed when

- The fasting blood sugar level is 126 mg/dl or higher on two occasions
- The blood glucose is greater than 200 at any time of the day WITH symptoms such as frequent urination, or thirst
- The blood glucose level is above 200 mg/dl 2 hours after eating.

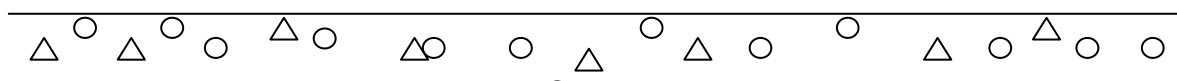
What happens when diabetes occurs?

The portion of the pancreas responsible for blood sugar control is a group of cells known as the islet of Langerhans. Islet contains two types of cells that help regulate blood glucose. The first type is beta cells, which lower the glucose by producing insulin. The second types of cell are alpha cells which raise the glucose by producing glucagon. See illustration below:

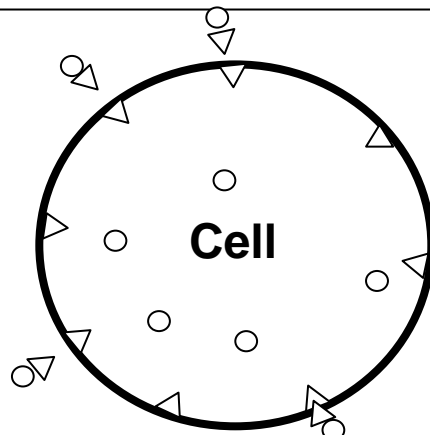
Normal Glucose (Sugar) Metabolism

○ = Glucose

△ = Insulin



Insulin allows
glucose (sugar) to
enter the cells



← Insulin receptor sites bind
with insulin and allow glucose
(sugar) to enter the cell

Beta cells produce insulin. Insulin is a hormone that allows glucose (blood sugar) to enter the body's cells. Beta cells lower glucose by measuring the amount of blood sugar in the bloodstream and releasing the exact amount of insulin needed to put glucose from the bloodstream into the cells.

Insulin is released by the beta cells in two phases. The first phase occurs during the first fifteen minutes of eating. Insulin has already been produced and is waiting for release. The second phase insulin release is more sustained. Beta cells make some insulin immediately after eating food.

Alpha cells raise glucose by producing glucagon. Glucagon is a hormone that causes the liver to release glucose in the bloodstream.

For people who do not have diabetes, islets release enough insulin and glucagon to maintain normal blood sugar levels. It is rare for those who do not have diabetes to have their blood sugar extremely high because beta cells constantly check blood sugar and are able to make enough insulin to keep the blood sugar normal.

Types of Diabetes

Type 1 Diabetes

Type 1 diabetes can happen at any age but it usually affects people who are younger than 30 years old. Type 1 diabetes occurs when the body's immune system destroys the beta cells. No one knows why this happens. Some researchers think it may be caused by:

- Viruses
- Heredity
- An auto-immune condition
- Environmental or chemical toxins

Without Beta cells, a person with type 1 diabetes cannot produce insulin. This causes blood sugar levels to rise. The cells of the body begin to starve because glucose cannot enter the cell without insulin. The person will often experience sudden and severe symptoms of high blood sugar. These symptoms can include:

- Increased thirst
- Increased urination
- Increased hunger
- Weight loss
- Fatigue
- Blurry vision

People with type 1 diabetes will need lifelong insulin therapy in order to control the disease.

Type 2 Diabetes

Type 2 diabetes is much more common than type 1 diabetes. It accounts for about 90 percent of patients with diabetes in the US. Type 2 diabetes usually happens in people over the age of 30, but is becoming more common in children and adolescents who are overweight. Unlike those with type 1 diabetes, people with type 2 diabetes continue to make insulin. They may or may not need insulin therapy. Their insulin production may be high, normal or low. In type 2 diabetes blood sugar levels become high as the cells do not respond normally to the insulin present in the body. This is known as insulin resistance. People with type 2 diabetes can experience the same symptoms of high blood sugar:

- Increased thirst
- Increased urination
- Increased hunger
- Weight loss
- Fatigue
- Blurry vision

Some people experience a delay in being diagnosed because the symptoms are often less severe and they sometimes go undetected.

Causes of Type 2 Diabetes

- **Beta Cell Defect** – over time, the insulin making cells produce less and less insulin.
- **Reduced Beta Cell Mass** – People with type 2 diabetes have about half of the insulin making cells, as they should for their body weight.
- **Post Receptor Defect** – Once insulin gets to the cell, the cell does not regulate insulin activity properly. This causes insulin resistance.
- **Beta Cells Unresponsive to High Blood Sugar** – the beta cells do not respond to rising blood sugar levels by making more insulin.

Risk Factors for Type 2 Diabetes

- **Family History** – children of people with type 2 diabetes have a 15% chance of developing type 2 diabetes. In identical twins, if one has type 2 diabetes, the other has a 90% chance of also having it.
- **Race** – Pima Indians have a 50% chance of developing type 2 diabetes. Hispanics, African-Americans, Pacific Islanders and Asians have an increased risk for type 2 diabetes compared to Caucasians.

- **Being Overweight** – Most people with type 2 diabetes are obese. As weight increases, so does the chance of developing type 2 diabetes.
- **Body Fat Distribution** – Abdominal fat increased the risk of type 2 diabetes.
- **Sedentary Lifestyle** – Studies have shown that 45 minutes to 1 hour per day of physical activity will decrease the chance of developing type 2 diabetes. Many people who develop type 2 diabetes do not exercise on regular basis.

Other Types of Diabetes

Secondary Diabetes

Secondary diabetes occurs as a result of other diseases or treatments and may or may not resolve once the underlying cause is treated. Patients experience the same symptoms as with type 1 and 2 diabetes. Some causes include:

- Any disorder affecting the pancreas such as hemochromatosis, pancreatitis, pancreatic cancer, or a removal of the pancreas (pancreatectomy)
- Cushing's syndrome, pheochromocytoma, or acromegaly
- Cancer treatments such as steroids and some chemotherapies

Routine Health Maintenance

People with Diabetes need consistent monitoring in order to avoid complications of high blood sugar. People with diabetes should pay particular attention to the following:

Eyes

People with diabetes are at risk for diabetic retinopathy-the leading cause of blindness in the US for persons aged 20-74. In order to detect retinopathy, all patients should have at minimum a yearly dilated and comprehensive eye exam. If retinopathy is present, you will need more frequent monitoring.

Immunizations

People with diabetes are more susceptible to contagious diseases and often have more complications from those diseases than people without diabetes. They should therefore receive the following vaccinations:

- Yearly influenza vaccine.
- Pneumococcal vaccine: one-time dose and then re-vaccinate once the patient is older than 65 years and received the vaccine greater than 5 years prior.
- Receive tetanus booster every 10 years.

Kidneys

As diabetes is the leading cause of end stage renal disease, you should get yearly tests for microalbuminuria, serum creatinine, and Glomerular filtration rate (GFR).

Feet

You should have your feet examined at minimum once a year by your diabetes healthcare provider, more often if you have high risk feet. Listed are some tips to making sure you have proper foot health:

- Look at your feet every day-use a mirror or have someone help you if necessary.
- Examine all areas of your feet: top, bottom sides, heels and between the toes.
- Inspect your shoes daily by feeling the inside for any torn or loose areas, cracks or irregularities than may irritate skin.
- Wear well-fitting shoes with well fitting soft cotton or wool socks.
- Do not go barefoot-even indoors.
- Wash feet daily with mild soap.
- Dry thoroughly-especially between the toes.
- Moisturize feet daily with an alcohol-free lotion. Do not apply between the toes.
- Trim and file nails straight across, filing all sharp edges. Do not trim calluses, corns or ingrown toenails yourself.
- Seek professional help for any cuts, blisters, calluses, or wounds.

Teeth

People with Diabetes are more prone to develop periodontal disease, a process that affects the supporting structures of the teeth that can result in tooth loss. In order to prevent this you should:

- Brush teeth twice daily with a soft toothbrush and Fluoride toothpaste.
- Floss teeth daily.
- Visit the dentist every 6 months for an exam and cleaning.

You should keep a record of your routine health check-ups:

Routine Health Exams	How often	Visit Dates	Visit Dates	Visit Dates
Eye Exam	Every Year			
Foot Exam	Every Year			
Kidney Tests	Every Year			
Immunizations				
-Flu	Yearly			
-Pneumonia	As needed			
-Tetanus	Every 10 years			
Teeth	Every 6 months			

For more information on diabetes please contact:

The Endocrine Center

Monday through Friday, 8 a.m to 5 p.m
713-563-7600