

## Hypoglycemia

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### Definition

Hypoglycemia is a condition in which the level of sugar (glucose) in the blood is abnormally low.

### Introduction

The level of sugar in the blood is usually maintained within fairly narrow limits despite the fact that we eat and fast at irregular intervals. The normal range for blood sugar is about 60-120 milligrams per deciliter of blood. When the blood sugar falls below 45-50 mg/dl it is usually associated with and symptoms serious problems. Hypoglycemia occurs in roughly 1 in a 1,000 people.

Maintaining the blood sugar within the normal range is a complicated business. It begins with eating. Foods are broken down in the intestinal tract and absorbed into the body in the forms of sugars, proteins and fats. This leads to an increase in the blood sugar. The body responds by increasing the amount of a hormone called insulin that is produced by the pancreas. Insulin pushes blood sugar into the cells, thereby decreasing the blood sugar levels and making the sugar available to the cell. Sugar is the main fuel that cells have to do their work. If no sugar is available the body can make glucose from glycogen stored in the liver (this is called glycogenolysis.) Epinephrine and another hormone called glucagon can stimulate glycogenolysis. The body can also make glucose from non-carbohydrate sources such as lactate, pyruvate, glycerol and amino acids (these are breakdown products of fats and proteins.) This process is called gluconeogenesis. Other hormones that can play a part in maintaining normal blood sugar levels are corticosteroids, catecholamines and human growth hormone.

There are many causes of hypoglycemia. Here are some of them:

1. Too much insulin.
  - a. The body makes too much insulin (islet cell tumor)
  - b. The body is given too much insulin (treatment of diabetes)
2. Abnormality in other endocrine glands such as the pituitary or adrenal glands
3. Abnormality in the liver's storage of carbohydrate or ability to produce glucose and/or extensive liver disease (from hepatitis, alcoholic cirrhosis or cancer)
4. Drugs that can cause hypoglycemia include:
  - a. Drugs for diabetes (like sulfonylureas)
  - b. Other drugs like petamidine, beta-blockers, aspirin and alcohol
5. Prolonged exercise
6. Certain inborn errors of metabolism (like galactosemia or fructose intolerance)
7. As a result of certain kinds of abdominal surgery.
8. Other conditions include kidney or heart failure, cancer, shock, severe infection (sepsis) and malnutrition. Prolonged fasting does not usually cause hypoglycemia unless another disease is present.
9. Reactive hypoglycemia occurs as a reaction to eating, usually carbohydrates.

Symptoms of hypoglycemia are usually seen when the blood sugar drops to 45 mg/dl or below, but may occur at higher levels. Epinephrine (the fight or flight hormone) helps release body stores of glucose but also causes symptoms of sweating, nervousness, faintness, shakiness, palpitations and hunger. Inadequate sugar to the brain causes inability to concentrate, vision problems, seizures and coma. Prolonged hypoglycemia can lead to permanent brain damage.

## Diagnosis

Hypoglycemia is diagnosed by measuring the blood sugar level. A level at or below 45 mg/dl is hypoglycemic. Most of the time hypoglycemia is caused by giving too much insulin to an individual with diabetes. When hypoglycemia occurs in an individual who does not have diabetes it is extremely important to determine the cause so a variety of tests may be done. These tests may include the oral glucose tolerance test, checking insulin and other hormone levels, and other intravenous tests. If a tumor is suspected, CT scans or MRI scans, ultrasound or even surgery may be required.

## Prevention and Treatment

Individuals with diabetes require careful monitoring and should follow their individual diabetes management plan.

Taking in sugar in any form can usually relieve symptoms of hypoglycemia. Candy, glucose tablets or paste, fruit juice, water with several tablespoons of sugar in it or milk are good sources of sugar. People who have recurrent attacks of hypoglycemia should carry glucose tablets or glucose paste. They may also keep injectable glucagon on hand. Glucagon is a pancreatic hormone that stimulates the liver to produce large amounts of glucose from its carbohydrate stores. When the individual cannot take anything by mouth, glucose can be administered intravenously by a doctor. Eating small frequent meals (instead of three meals a day) and following a regular exercise program is usually recommended.

Insulin-producing tumors must be removed surgically.

People prone to hypoglycemia should carry identification or wear a Medic Alert bracelet.

## Emergency Situations – What can go wrong?

Prolonged hypoglycemia can lead to seizures, coma, permanent brain damage or even death.

If hypoglycemia is suspected then GIVE SUGAR. Good sources of sugar include:

1. Candy
2. Glucose tablets or paste
3. Fruit juice
4. Milk
5. Water with 1 or 2 tablespoons of sugar in it

Individuals with diabetes should follow their individual diabetes management plans.

Notify nurse or PCP of episode of hypoglycemia.

If the individual does not respond to sugar taken by mouth within 5-10 minutes then call 911.

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