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Ashford Hospital
London Road
Ashford, Middlesex
TW15 3AA
Tel: **01784 884488**

St. Peter's Hospital
Guildford Road
Chertsey, Surrey
KT16 0PZ.
Tel: **01932 872000**

Website: **www.ashfordstpeters.nhs.uk**

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Introduction to Diabetes

Patient Information

Further Information

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Author: Sue Berry **Department:** Diabetes / Endocrinology
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Insulin secretion is based on a negative feedback system related to blood sugar levels.

Other hormones do affect insulin production eg. samatostatin inhibits selection.

As insulin production of the body usually depends upon the amount of carbohydrate intake and also the amount of carbohydrate used in exercise etc. Insulin intake must be constantly balanced against them.

Introduction to Diabetes

What is Diabetes?

Diabetes Mellitus is not a single hereditary disease but a heterogeneous group of diseases, all of which ultimately lead to an elevation of glucose in the blood (hyperglycaemia) and loss of glucose in the urine as hyperglycaemia increases.

It is also characterised by the three "polys" and inability to re-absorb water, resulting in increased urine production (polyurea) excessive thirst (polydipsia) and excessive eating (polyphagia).

Type 1 Diabetes

Occurs abruptly, characterised by an absolute deficiency of insulin due to a marked decline in the number of insulin producing beta cells (perhaps caused by the auto immune destruction of beta cells) even though target cells contain insulin receptors.

Type 1 diabetes is also known as insulin dependant diabetes and juvenile onset diabetes, as it most commonly develops in people under 20 years old though it persists through life, and requires periodic insulin injections to treat it.

Although type 1 diabetes appears to have certain genes which make them more susceptible, some triggering factor is required e.g. viral infection, shock etc.

Type 2 Diabetes

It most often occurs in people who are over forty and overweight hence another name "maturity onset diabetes". Clinical symptoms are mild, and high glucose levels in the blood can usually be controlled by diet, exercise, and/or with anti diabetic drugs.
Some type II diabetes have sufficient amounts of insulin in the blood, but they have defects in the molecular machinery that mediates the action of insulin on its target cells, cells can become less sensitive to insulin because they have fewer insulin receptors.

Type II diabetes is therefore called non-insulin dependant diabetes. 90% of all cases are type II.

The Pancreas

The pancreas can be classified as both an endocrine and exocrine gland. Thus it is referred to as a heterocrine gland, but we will only be looking at its endocrine functions here. The pancreas is a flattened organ located posterior and slightly inferior to the stomach. The adult pancreas consists of a head, body and tail. The pancreas contains approx. one million clusters of inlets of langerhans. Three kinds of cells are found in these clusters.

'X' Alpha cells which secrete the hormone glucagon which raises the blood sugar level.

'B' Beta cells which secrete the hormone insulin that lowers the blood sugar level.

'D' Delta cells which secrete Samatastatin which inhibits the secretion of insulin, glucagon and growth hormone.

Glucagon

This hormones principle physiological activity is to increase the blood glucose level. It does this by accelerating the conversion of glycogen into glucose (glycogenesis) which the liver then releases into the bloodstream.

Secretion of glucagon is directly controlled by the level of blood sugar via a negative feedback system. When the blood sugar level falls below a certain level chemical sensors in the alpha cells of the inlets stimulate the cells to secrete glucagon.

Once the blood sugar level has risen cells are no longer stimulated, and production slackens. Glucagon secretion is inhibited by GHIH (samastostatin).

Insulin

Insulin is produced by the inlet Beta cells, and acts to lower blood sugar levels. It does this by accelerating the transport of glucose from the blood into cells (especially muscle). Glucose entry into cells depends on the presence of insulin receptors on the surface of the target cells. It also accelerates the conversion of glucose into glycogen (glycogenesis).

Insulin also decreases gluconeogenesis and glycogenolysis, stimulates the conversion of glucose and of other nutrients into fatty acids (lipogenesis), and helps stimulate protein synthesis.