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# Diabetes Mellitus

Diabetes Mellitus is a group of metabolic diseases characterized by high blood glucose. The high blood glucose is a result of the absence or not enough insulin or because cells do not respond to the insulin produced. Left untreated, diabetes can cause both acute (ketoacidosis -acidic blood pH) and chronic complications (cardiovascular disease, renal failure, blindness, infections, and nerve damage). There are three main types of diabetes mellitus: Type 1, Type 2, and gestational diabetes.

## Type 1 Diabetes Mellitus

Type 1 diabetes mellitus is the result of the loss of beta cells leading to severe insulin deficiency. Beta cell loss is caused by a T-cell-mediated autoimmune attack for reasons that are not yet understood. Type 1 diabetes accounts for about 10% of all cases of diabetes mellitus and usually affects the individual before 14 years of age. Even though the blood glucose levels are extremely high, without insulin, many cells cannot access the glucose, and as a result, they send signals requesting more glucose. Ironically, other hormones are released (cortisol, glucagon, epinephrine) in response to the signals requesting more glucose, which worsens the situation. If the body "thinks" that it doesn't have enough glucose then it breaks down other substances (proteins) to provide substrates for glucose production (gluconeogenesis). With an increase in substrates, the liver frantically works to convert them to glucose, and over time, the increased load overwhelms the liver enzymes and bi-products such as ketone bodies begin to accumulate. Ketone bodies re-enter the circulation and can create a condition called ketoacidosis (low blood pH). To increase the movement of fat from the adipose tissue to the liver requires the excessive use of LDLs which can build up and contribute to plaque formation. The constant breakdown of fats and proteins results in profound weight loss or wasting.

Other symptoms include

- **Polyuria** - (excessive urine production) because the increased plasma glucose exceeds the renal threshold for glucose reabsorption (kidney module)
- **Polydipsia** - (excessive thirst and drinking of water) due to the dehydration from excessive urine production
- **Polyphagia** - (excessive eating) due to the inability of the body’s cells to utilize the nutrients in the blood.

Treatment of type 1 diabetes is administration of insulin either by injection or via an indwelling catheter. If not treated it results in death.

## Type 2 Diabetes Mellitus

Type 2 diabetes mellitus is the result of a reduced response by the cells to insulin and is sometimes referred to as insulin resistance. Type 2 diabetes accounts for about 90% of the cases of diabetes mellitus. This type has a significant genetic component and is highly correlated with obesity as 80% of type 2 diabetics are obese. Thus, type 2 diabetes mellitus is due primarily to lifestyle factors and genetics. The symptoms of type 2 diabetes are not as severe as with type 1 because there is still some effect of insulin. Nevertheless, the chronic complications mimic those observed in type 1. Perhaps the most unfortunate thing about type 2 diabetes is that those who develop it are essentially asymptomatic for many years, but when the diabetic symptoms appear, the damage to the tissues and organs can be extensive. Drugs used to treat type 2 can stimulate beta cell secretion of insulin, slow digestion of carbohydrates, inhibit

liver glucose production or directly increase the sensitivity of the target cells to insulin. Also, significant lifestyle changes such as getting regular exercise, careful dieting and losing weight can improve one's ability to process the glucose and reduce complications.

## Gestational Diabetes

Gestational diabetes mellitus occurs in women during pregnancy and is very similar to type 2 diabetes in that the affected individual is less responsive to insulin. This type of diabetes occurs in 2-5% of all pregnancies and around 50% of affected women will develop type 2 diabetes in their life. If left untreated, gestational diabetes poses risks to both mother and child, all related to the uncontrolled high blood glucose levels. Risks to the baby include abnormal growth and chemical imbalances at birth. Infants born to mothers suffering from gestational diabetes are typically larger for their gestational age. Other risks for the infant include, low blood glucose, jaundice, polycythemia (high red blood cells), lung disorders, and increased risk of developing type 2 diabetes in their lives.

An excellent video resource on Diabetes Mellitus, please see this video by Osmosis: https://books.byui.edu/-ZVVb

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