Health Matters

Diabetes Mellitus

The Disease

The ancient Chinese of 1500 BC knew that the urine of patients with "the wasting condition" was sweet. They also recognized that these people drank copious amounts of fluids, and urinated literally gallons of urine daily. The latin for honey is miel, and mellitus is derived from there. And diabetes means "to run over", so diabetes mellitus is simply "running over with honey", or, lots of sweet urine.

So why is the urine of diabetics so sweet? First, one must understand that sugar, or more specifically, glucose, is the primary source of energy for the body. The food we eat that is starchy, sugary, or made up of carbohydrates, is broken down by the body to glucose. The glucose enters the blood stream and is distributed to the various cells of the body for their use as an energy source. Very few cells, however, can simply grab this glucose without help. The help comes in the form of a great, huge, "controller" molecule called Insulin. When the level of glucose rises in the blood, insulin is secreted (from an organ called the pancreas), which helps the cells take the glucose out of the blood, the blood glucose level falls, and the insulin secretion drops.

It the glucose is not taken out of the blood, ie. if there is either no insulin, or inadequate insulin, then the blood glucose level becomes increasingly higher. The kidney, which filters our blood but never allows sugar to escape, becomes overloaded, at which point glucose starts to "spill over", therefore "sweet urine".

The 1903 Medicology Textbook says "The most positive influence in diminishing the disease belongs to opium". There was no cure - just make them feel good.

The Problems

1. HYPOGLYCEMIA - Not enough sugar in the blood. This is defined as blood glucose levels less than 3.0 mmol/l. There are many symptoms (see below) usually due to lack of sugar to the brain. The treatment is to elevate the blood sugar level, and this is done by eating some form of sugar immediately - fruit juice, candy, chocolate bars, soft drinks, honey, sugar cubes - and followed by a regular meal within the next hour.

2. HYPERGLYCEMIA - Too much sugar in the blood. This is defined as blood glucose levels above 13.0 mmol/l and is an indication that your diabetes is out of control. The best treatment is to return to your daily diabetic plan - which includes proper diet, proper exercise, medication adjustment and monitoring blood glucose levels.

Signs of Hypoglycemia	Signs of Hyperglycemia
1. Shakiness	1. Feels very thirsty
2. Starts to perspire	2. Urinate frequently
3. Early morning headaches	3. Feel unusually sleepy
4. Feels hungry	4. Nausea & vomiting
5. Nightmares	5. Irritability, blurred vision
6. Irritable, agitated, confused - especially the elderly	6. Includes susceptibility to infections

Diabetes Mellitus

Type I - Insulin Dependent	Type II - Non-Insulin Dependent
1. Onset age: Before 40	1. Onset age: After 40
2. Onset: Abrupt	2. Onset: Gradual
3. Symptons: Thirst, increased appetite, urinary frequency, weight loss	3. Symptons: Sometimes none, Sometimes similar
4. Stability: Wide fluctuations of blood glucose, marked sensitivity to diet, exercise and insulin	4. Stability: Usually easily controlled
5. Insulin is absent in body	5. Insulin usually present
6. Hypoglycemia: More frequent	6. Hypoglycemia: Unusual

3. SMALL BLOOD VESSEL DISEASE - When blood glucose levels stay high over a period of time, the small blood vessels may be damaged. High blood glucose levels stiffen red blood cells, making it more difficult for them to enter the tiny blood vessels. These "stiff" blood cells bang agains the walls of the vessels causing damage, weakness and eventually, bursting. When these tiny blood vessels are damaged, the organs that they supply with blood will become damaged also. This is why uncontrolled or poorly controlled diabetes is associated with eye problems (retinopathy), kidney problems (nephropathy), sensory nerve problems like numbness, tingling, pain (neuropathy), and circulation problems in the fingers and toes.

4. LARGE BLOOD VESSEL DISEASE - Diabetics tend to be more susceptible to developing atherosclerosis - a hardening and thickening of blood vessel walls due to deposits of cholesterol. These deposits cause vessels to narrow, with subsequent reduced blood flow that possibly can lead to high blood pressure, strokes, heart attacks and poor circulation in the hands and feet. Atherosclerosis can be prevented, or at least slowed down, by lifestyle changes - meal plans low in sugar and fat, regular physical activity, smoking cessation and reducing alcohol consumption.

The Treatment

Since Banting's and Best's isolation of insulin in 1921, the prognosis for diabetes has improved dramatically. The main question is no longer whether diabetics will live or die, but (1) How long they will live, and (2) How to reduce complications to a minimum throughout their lifespan. The treatment for both types of diabetics is not only to reduce blood glucose levels with medications - that is the easy part but the treatment also must include a great deal of education - "He who knows most will live the longest" - and often a change of lifestyle. The diabetic must take a major role in self management of the disease. Doctors, pharmacists, diabetic teachers - they are all important, but the key to good control, good health and long life, is the diabetic himself. This cannot be overemphasized.

Insulin

Insulin, the "controller" molecule which is in short supply in all diabetics, is the mainstay of treatment. Type I diabetics have no self-producing insulin, ie. they have no choice but to use daily injections of insulin. Type II diabetics, if their disease progresses, will eventually require insulin, but depending on their own self management, often can be maintained on oral medication only. Insulin of cows and pigs is very similar to that of humans, and for years, the pancreas of these animals provided the source of insulin for medical use. In the past decade, human insulin has become available through a variety of techniques, and it now has largely replaced the beef/pork variety.

Oral Medication

Oral medication, useful only to Type II diabetics, basically helps the patient's own, self-produced insulin to work better. In some cases the medication stimulates the pancreas to produce more insulin, or it may affect the cells to be a little more sensitive to the insulin that is produced. The object of both the above treatments is to increase insulin supply and lower the blood glucose levels. Education and medication are essential components to diabetes treatment - and for the successful self manager, so is information. The most important form of information that the diabetic must know is the level of their blood glucose. The easiest and cheapest way to obtain this information is with a Blood Glucose Monitor - available at virtually any pharmacy. They are simple to use, easy to understand, and they tell the diabetic how he is doing with his self management. If the sugar levels are high, that knowledge allows him to adjust meal plans, activity, medication, etc. to lower them. If they are at a reasonable level, the knowledge allows him to pat himself on the back. Self Blood Glucose Monitoring puts the diabetic "in control" of his disease. There are many types of Blood Glucose Monitors on the market - ask your pharmacist to explain the advantages of each.

REPORT 1: UNDERSTANDING THE DIAGNOSIS

DIABETES

The two types of **diabetes*** are **Type I (insulin-dependent diabetes)** and **Type II (non-insulin-dependent diabetes).** Type I diabetes usually is diagnosed in children or young adults. Type II diabetes, which is much more common, generally affects people after age 40 and, despite the name, may be treated with **insulin.**

The food we eat is broken down into simple sugars such as glucose, which is the source of energy for many of the body's cells. In diabetes, the body has trouble using glucose, so blood glucose levels become abnormally high.

RISK FACTORS

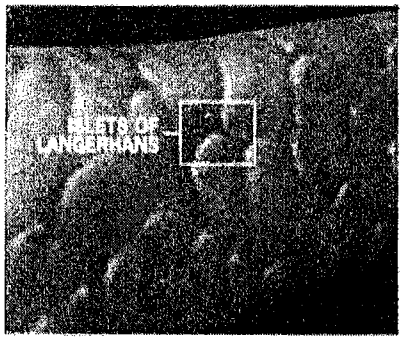
- A family history of diabetes
- Race and ethnic background. African-Americans, Mexican-Americans, Native Americans and Asian-Americans are at higher risk
- Being overweight

MAKING THE DIAGNOSIS

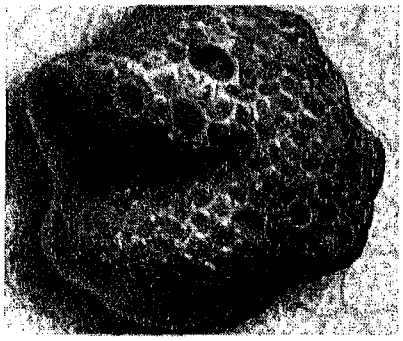
Being thirsty, needing to urinate frequently and increased appetite with weight loss are the most common signs of diabetes. But symptoms vary, and some people have no signals of the condition. A physical exam, patient history and blood tests are needed to confirm a diagnosis.

HOW THE BODY USES GLUCOSE

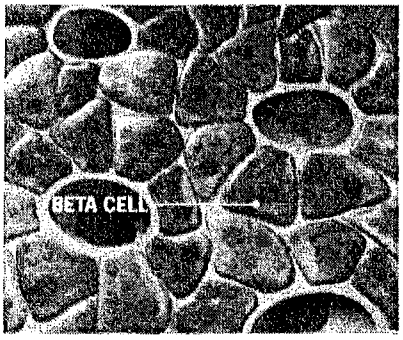
One role of the **pancreas** is to regulate the amount of glucose in the blood.



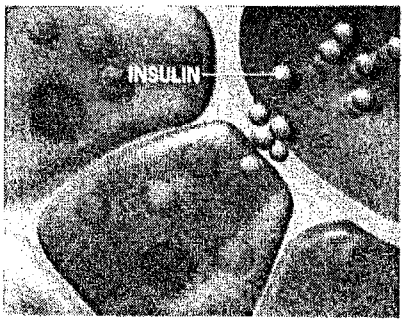
▸ Tiny structures inside the pancreas called the **islets of Langerhans** secrete hormones.



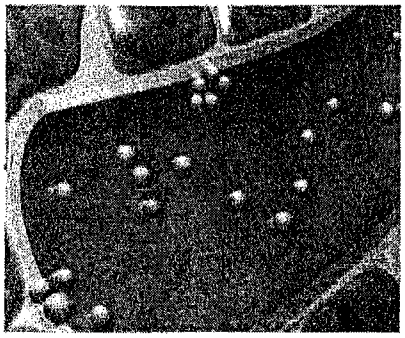
▸ These islets have several types of cells.



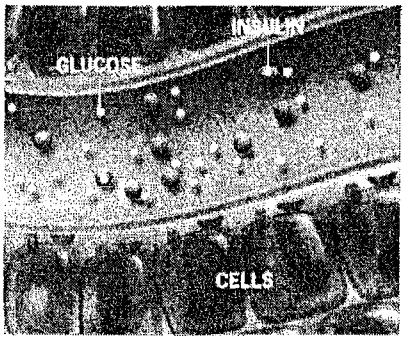
▸ They include beta cells, which produce the hormone insulin.



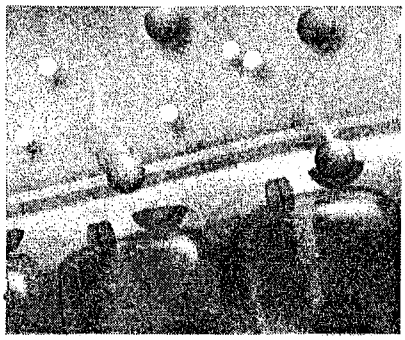
▸ Normally, these beta cells release insulin after a meal.



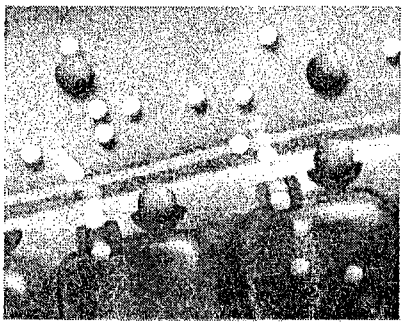
▸ The insulin passes into the bloodstream.



▸ Both insulin and glucose travel to liver, muscle and fat cells.



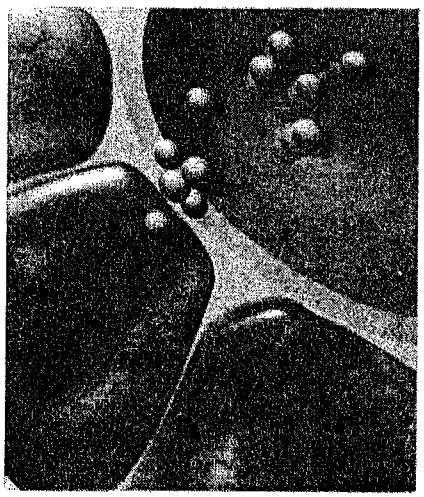
▸ Insulin attaches to specific sites on the cells.



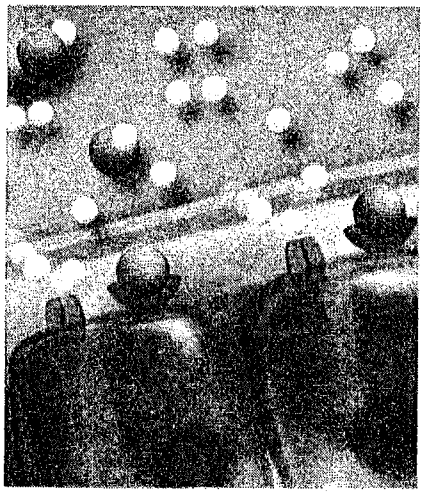
▸ This prompts a gate to open, which allows glucose to enter the cell, where it is stored or changed into energy.

THE TWO TYPES OF DIABETES

In diabetes, these functions break down and the body can no longer process simple sugars. In Type I diabetes, the beta cells cannot produce any insulin.



▸ In Type II diabetes, some insulin may still be produced.



▸ It attaches to the cells, but the gates may fail to open and less glucose can enter.

REPORT 3: TREATMENT AND MANAGEMENT

Diet,* exercise* and medication, if necessary, form the three parts of the program to manage your diabetes. By maintaining blood glucose levels close to normal, you can reduce the risk of long-term complications.

DIET

General recommendations:

- Lose weight, if you are overweight
- Avoid foods with sugar, salt and saturated fats
- Eat complex **carbohydrates** such as potatoes, pasta, rice, peas and beans and foods high in fiber

EXERCISE

- Lets you use insulin more efficiently
- Reduces stress that causes blood sugar levels to climb
- Helps reduce the risk of cardiovascular disease

MEDICATION

For about one fourth of people with Type II diabetes, diet and exercise will control blood sugar. Everyone with Type I diabetes requires insulin; and for best control, many people with Type II diabetes may need it as well. Some patients with Type II diabetes may be prescribed one of the **sulfonylureas** and/or **metformin**, which are taken orally.

CHECKING GLUCOSE LEVELS

One of the responsibilities you have is to keep track of your blood glucose levels. Home glucose monitoring tests are available in most well-stocked pharmacies. A finger prick with a special needle is needed to get a drop of blood that can be tested with a specially treated paper or a meter.

Your nurse or diabetes advisor will tell you more about the importance and benefit of frequent monitoring of your glucose levels.

What about the increased risk for cardiovascular disease with diabetes?

The chief cause of death in diabetics is cardiovascular disease. People with diabetes tend to develop heart and blood vessel disease earlier than those without diabetes. A healthy diet and exercise coupled with adherence to a treatment regimen will help to reduce these risks.

How can I plan a healthy diet?

Become familiar with these three concepts: portion size, what to eat and when and how to include favorite foods in a diet tailored for diabetes. Pay attention to cholesterol-controlling choices.

Why is the timing of food intake and insulin administration important in managing diabetes?

It's important to coordinate food intake with the time you take insulin, so that the insulin is available to help glucose from food enter the body's cells. Careful control of blood sugar *can* prevent many long-term health complications.

Name: _____

Date: _____

HEALTH SCIENCE 12

Topic #2 - DIABETES

- **Answer the following questions (point form if you wish) on a separate piece of lined paper under the title "DIABETES REVIEW"**

1. **Give the literal translation for "Diabetes Mellitus".**
2. **What molecule is the primary source of energy for the body?**
3. **Describe what <u>should happen</u> in a healthy person when their blood glucose level rises to too high of a level.**
4. **Define each and list at least three main symptoms for each**
   A) Hypoglycemia
   B) Hyperglycemia
5. **If diabetes is not properly controlled, what affects/symptoms will be felt on the body?**
6. **How long ago was Insulin first isolated and by who?**
7. **Describe the key differences between TYPE I Diabetes and TYPE II Diabetes.**
8. **List some symptoms that are typical of someone who is diabetic but doesn't know it yet. Indicators of possibly being diagnosed with diabetes.**
9. **Describe the relationship between and the significance of both the islets of Langerhans and beta cells.**
10. **Give a detailed description of how insulin works.**
11. **List the key recommendations that a diabetic should follow, after being diagnosed as a diabetic.**
12. **Why are things like; poor circulation → gangrene, cardiovascular disease, blindness and kidney disease so commonly associated with uncontrolled diabetes.**