

Insulin

Time: 40 Minutes (one period)

Lesson Learning Goals:

By the end of the lesson students will be able to:

- Identify what insulin is and its purpose

Materials:

Everyone Jump music CD (Song 6: *Insulin*)
CD player
Insulin Reference Copy Master (at end of lesson)
Song Lyrics for Song 6: *Insulin* (at end of lesson)

Lesson at a Glance:

1. Students will listen to the song and follow along using the lyrics sheet.
2. Students will represent the information from the song using an graphic organizer.
3. Students will present and share their information.

Other Lessons Might Include:

1. Research and present information on Banting and Best.
2. Retell the story of the discovery of Insulin.
3. What are some of the effects of type 1 and type 2 diabetes. How can they be treated and managed?

Teaching/Learning Strategies

Prior to the lesson, provide each student with a copy of the Insulin Reference Copy Master and with Song Lyrics for Song 6: *Insulin*. Alternatively prepare these materials for overhead use.

1. Prior Learning:

- a) Provide students with the Insulin Reference Copy Master to read prior to listening to the song.
- b) Have the students ask any specific questions they have immediately after reading the article.

2. Graphic Organizer:

- a) Play the song for the students to listen to and follow along with.
- b) Explain to the students that they are to create a graphic organizer like a Flow Chart or Concept Map that will present a visual representation of the words (see the sample at the end of the lesson).
- c) Play the song again, and ask students to individually make notes as they listen to the song for the second time (students may use the lyric sheet handed out at the beginning of the lesson to jot down notes).
- d) Students will individually work on a graphic organizer of their choice using both the information that they heard in the song and the information they read on the Insulin Reference Page, BLM6a.

3. Pair and Share:

- a) When students have completed their graphic organizer, they find a partner and take turns presenting what they have created.
- b) The listener then provides any suggestions and feedback that could help improve the quality or accuracy of the presenter's work.
- c) The presenter makes note of the suggestions, and is then ready to edit if they choose to do so.
- d) The students will switch roles.
- e) After the feedback time, give students some time to do any editing desired before handing in or presenting their work.
- f) Students present their work.

4. Leading the Way:

- a) After each presentation, lead the class in a short (30-45 second) activity blast.
- b) Sample of this could be 10 second stand and stretch to the ceiling, to the floor, out to the sides, 10 seconds of walking on the spot, 15 seconds of fast walking with knees up high and finally 10 seconds of deep breathing while students sit back down in their chairs and refocus for learning.

5. Sharing

- a) Students can share their information or have the information posted in the classroom for future reference.

Insulin Reference Copy Master

What is insulin?

Insulin is a hormone, and therefore a protein. Insulin is secreted by groups of cells within the pancreas called islet cells. The pancreas is an organ that sits behind the stomach and has many functions in addition to insulin production. The pancreas also produces digestive enzymes and other hormones. Carbohydrates (or sugars) are absorbed from the intestines into the bloodstream after a meal. Insulin is then secreted by the pancreas in response to this detected increase in blood sugar. Most cells of the body have insulin receptors which bind the insulin which is in circulation in the blood. When a cell has insulin attached to its surface, the cell activates other receptors designed to absorb glucose (sugar) from the blood stream into the inside of the cell.

What happens if you don't have insulin?

Without insulin, you can eat lots of food and actually be in a state of starvation. Because insulin helps to move glucose into the cells, without insulin many of the cells are unable to access the calories contained in glucose from the food we eat. This is why Type 1 diabetics who do not make insulin can become very ill without insulin shots. Insulin is a necessary hormone. Those who develop a deficiency of insulin must have it replaced via shots or pumps (type 1 diabetes). More commonly, people will develop **insulin resistance**, a preliminary stage in the development of Type 2 Diabetes, rather than a true deficiency of insulin. In this case, the levels of insulin in the blood are similar or even a little higher than in normal, non-diabetic individuals. However, many cells of Type 2 diabetics respond sluggishly to the insulin they make and therefore their cells cannot absorb the sugar molecules well. This leads to blood sugar levels which run higher than normal. Aggressive control of blood glucose levels is equally important in Type 2 diabetes. Individuals may require medications and or insulin to achieve target levels.

How does the human body regulate blood glucose (blood sugar) levels?

The human body wants blood glucose (blood sugar) maintained in a very narrow range between 4.0 and 6.0 mmol/l (millimole per liter) of blood. Below 4.0mmol/l is termed "hypoglycemia" (Low amounts of glucose in the blood). Between 5.0 – 8.0 mmol/l can be normal if you have eaten within 2 hours. Above 10.0 mmol/l is termed "hyperglycemia" ("too much glucose in the blood").

Insulin and glucagon are hormones secreted by islet cells within the pancreas. They are both secreted in response to blood sugar levels, but in opposite fashion! Insulin is normally secreted by the beta cells (a type of islet cells) of the pancreas. Insulin is secreted when blood glucose is **HIGH**. The amount secreted into the blood increases as the blood glucose rises. Similarly, as blood glucose falls, the amount of insulin secreted by the pancreatic islets goes down. Insulin has an effect on a number of cells, including muscle, red blood cells, and fat cells. In response to insulin, these cells absorb glucose out of the blood, having the net effect of lowering the high blood glucose levels into the normal range.

Glucagon is secreted by the alpha cells of the pancreatic islets in much the same manner as insulin...except in the opposite direction. If blood glucose is high, then no glucagon is secreted. When blood glucose levels are very **LOW** (such as between meals, and during exercise), more and more glucagon is secreted. Like insulin, glucagon has an effect on many cells of the body, but most notably the liver. The effect of glucagon is to make the liver release the glucose it has stored in its cells into the blood stream, with the net effect of increasing blood glucose. Glucagon also induces the liver (and some other cells such as muscle) to make glucose out of building blocks obtained from other nutrients found in the body (e.g., protein).

Who discovered insulin?

Working at the University of Toronto 4 people played a role in the discovery of Insulin; Frederick Banting, Charles Best, J. J. R. MacLeod, and J.B. Collip. Prior to the discovery of Insulin in 1921, a diagnosis of diabetes meant almost certain death. The discovery of Insulin is considered to be one of the most significant medical discoveries in history. While insulin is not a cure for diabetes, it's discovery meant that the disease could be controlled. In honour of their achievement Fredrick Banting, and Charles Best were awarded a Nobel Prize for Medicine.

Song Lyrics for Song 6: *Insulin*

Sugar is a basic food, that your body has to use.
It goes from blood into your cells, a healthy body does this well
Sugar gives you energy, it comes from all the foods you eat.
What helps your body use this fuel, your insulin does this for you.

Insulin – what it can do,
Insulin – is good for you,
 – it has a job to do,
Insulin

With a lack of Insulin, the cells can't get the sugar in.
That leaves the sugar with your blood, and that's not where it should build up.
Over time that could hurt you, your heart, your eyes your kidney's too.
And that's the thing with D type 2, your insulin won't work for you.

Insulin – what it can do,
Insulin – is good for you,
 – it has a job to do,
Insulin – works for you

We can thank Banting and Best, they discovered insulin.
They found it in the pancreas, secreted by a group of cells.
Insulin's a hormone, and the pancreas a gland,
And those cells inside the pancreas, are the islets of Langerhan.

“Ok – let's review...”

After eating – here's the scene, sugar gets in your blood stream.
Then the next thing to begin, your pancreas sends insulin.
Insulin does one thing well, it gets the sugar into the cell.
There it's used as energy, and that's how it should always be
But if you can't make insulin, your blood will hold the sugar in,
If sugar can't get to the cells, that's the time you won't feel well.

Insulin – what it can do,
Insulin – is good for you,
 – it has a job to do,
Insulin – it works for you

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Sample Insulin Flow Chart

