Insulin & Diabetes

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Presentation Script & Guide

Slide 1-4: Title Slide

Slide 5: What is Insulin?

- When food is consumed, the digestive system converts carbohydrates into glucose molecules and then releases the glucose into the bloodstream. So naturally, blood sugar levels rise after eating. These elevated levels signal the pancreas to secrete insulin into the bloodstream to bind to insulin receptors on cell membranes, allowing the cells to receive, use, or store the glucose as needed.
- Source: https://www.verywellhealth.com/how-insulin-works-in-the-body-1087716

Slide 6: More About Insulin

- Source: https://www.verywellhealth.com/how-insulin-works-in-the-body-1087716

Slide 7: Insulin Kinetics

- Focus on the glucose and insulin blood levels
- Explain the axes of the graph, especially the x axis that shows 24 hours of the day, focusing on times where breakfast, lunch, and dinner are eaten
- It is easier to see specifically for lunch and dinner peaks, but explain how glucose levels peak first, with insulin levels following closely behind. This is a clear demonstration of how quickly the pancreas can detect blood glucose levels and react by adjusting its insulin secretion accordingly
- Source: https://en.wikipedia.org/wiki/Blood_sugar_level

Slide 8: Homeostatic Regulation of Blood Glucose

- This slide is geared towards AP Biology students who have an in-depth knowledge of how hormones interact with each other.
- Two new hormones are introduced here: Glycogen and Glucagon
- "When the body feels extra glucose is needed in the blood, the pancreas will release the hormone glucagon which triggers the conversion of glycogen into glucose for release into the bloodstream."
- Source: https://www.diabetes.co.uk/body/glycogen.html

Slide 9: Homeostatic Regulation of Blood Glucose

- This slide is geared towards AP Biology students who have an in-depth knowledge of

how hormones interact with each other, and can help explain the same process in the previous slide in a more interactive visual way.
- The top loop shows when blood glucose levels are higher than normal, while the bottom loop shows what happens when blood glucose levels are lower than normal.

Slide 10: Insulin Receptor Tyrosine Kinase Interaction

- Additional image for AP Biology students to visualize the relationship between insulin, insulin receptors, and glucose. Once both insulin and the phosphate groups are bound the the receptor, it triggers the glucose transport protein to allow glucose to travel from outside of the cell to inside the cell.
- Image Source: https://www.dietdoctor.com/a-new-paradigm-of-insulin-resistance

Slide 11: What is Diabetes?

- Cover the difference in treatments between the 2 types of diabetes. Since the body naturally cannot produce its own insulin in type 1 diabetes, treatment includes insulin, exercise, and a healthy diet. But, for type 2 diabetes, the initial treatment would be meal planning, weight loss, and exercising. However, that might not be enough to bring down blood glucose levels, which is where medications come in. If that is not enough, they might have to take insulin as well. All in all, for both types of diabetes, physical activity and diet are the two most important things to act upon.
- Diabetes also causes several side effects such as heart disease, stroke, and eye and food problems, for which additional medications are prescribed (including aspirin for heart health, drugs for high cholesterol, high blood pressure medications)
- Source: https://www.niddk.nih.gov/health-information/diabetes/overview/what-is-diabetes

Slide 12: Existing Diabetes Treatments

- Bariatric surgery is weight loss surgery, specifically for people who experience obesity. This can be a useful step to start managing type 2 diabetes.
- The artificial pancreas senses blood glucose levels and releases either glucose or glucagon as needed
- Pancreatic islet transplantation→ pancreatic islets are cell clusters in pancreas that make insulin. Transplantation of these islets into those with type 1 diabetes could help their pancreas to overcome its own immune attack. This method is still in testing.
- Source: https://www.niddk.nih.gov/health-information/diabetes/overview/insulin-medicines-treatments

Slide 13: Diabetes Statistics

- Source: https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf

Slide 14: Diabetes in the US

- Source: https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf

Slide 15: Characteristics of Insulin

- Source: https://www.diabetes.org/diabetes/medication-management/insulin-other-injectables/insulin-basics

Slide 16: Types of Insulin and How They Work

- Source: https://www.diabetes.org/diabetes/medication-management/insulin-other-injectables/insulin-basics

Slide 17: Existing Insulin Delivery Techniques

- Needle and syringe can ensure anywhere from 1-4 shots in a day
- Pen is more expensive than a needle and syringe but much easier to use
- Pump delivers insulin 24 hours a day in small, steady doses, and mimics the body's normal release of insulin
- **IMPORTANT CLARIFICATION! Oral insulin medications such as pills are currently still in development. Insulin is easily degraded by stomach acids, and therefore rendered useless. But, if there is a way to create these pills so they can bypass the stomach acids and still be active when they reach the liver, that would be most ideal.
- Sources:
  https://www.medicinenet.com/diabetes_treatment/article.htm#what_is_the_treatment_for_diabetes
- https://www.mayoclinic.org/diseases-conditions/type-1-diabetes/diagnosis-treatment/drc-20353017