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| **Project 2.3.2: Diabetic Emergency!** |

Introduction

Insulin is needed to maintain proper blood sugar levels, but in Type 1 diabetics, this balance does not happen naturally. The diabetic not only has to inject him or herself with insulin, but they also must keep the insulin level in balance with blood sugar, a feedback mechanism that happens naturally in non-diabetics. Since her diagnosis, Anna adjusted to checking and regulating her blood sugar with insulin. But on more than one occasion, she lost control of this balance and her body experienced a diabetic emergency. Read about each of these incidents and connect her symptoms to what was happening with her blood sugar, and consequently, her cells.

In Activity 2.3.1 you learned that monitoring blood sugar is vital for the health of Type 1 diabetics like Anna Garcia. The food Anna consumes is digested by the body and glucose is released into the bloodstream. Blood courses through the network of vessels connecting the top of the head to the tip of the toes. It transports the nutrients, oxygen, enzymes, and hormones that the body’s cells need to function and transports waste for disposal. Blood is filtered by the kidneys and excess water and other materials not needed by the body are then excreted as urine.

In this activity you will use a model of a cell to simulate how the body reacts to varying blood glucose concentrations. Cells in your body are surrounded by a semi-permeable membrane that regulates which molecules and substances can move in and out of the cell. It is referred to as semi-permeable because of its selective nature – some substances can move in and out, while others are not permitted passage. Chemicals and nutrients strive to maintain an equal balance on either side of the membrane. Glucose is too large a molecule to diffuse or simply pass through the phospholipids making up the cell membrane. However, water can easily move back and forth to even out the concentration of dissolved substances. This movement, called *osmosis*, maintains a water balance in the body. Excess or too little sugar in the blood can force water in or out of the body’s cells. Pay attention to the movement of water in each of your model cells and think about how this movement relates to the symptoms Anna experienced in each emergency situation.

Equipment

* Activity 2.1.1 Medical History Resource Sheet

Procedure

1. Take out Anna Garcia’s medical history document from Activity 2.1.1 and review her initial symptoms. Note that Anna mentions excessive thirst and frequent urination. As you complete this activity, think about how these symptoms relate to what is happening in her cells.
2. Read the three scenarios below. Each incident showcases one event in Anna’s struggle with diabetes. Circle any symptoms experienced by Anna. Maintenance of proper blood sugar levels through diet, exercise, and in the case of Type 1 diabetics, insulin, is vital to everyday health.

* **Scenario #1 (Anna, age 16)**

On a hot day in August, Anna pushed herself too hard in a soccer game that went into overtime. She felt dizzy, but she wanted to press on for her team. She ate a good meal before the game and took what she felt was the appropriate amount of insulin, but by the end of the game, she was trembling and clammy. Even though she felt weak and her vision was blurry, she stayed on the field with her teammates to celebrate the win. Before she made it back to the bench, she passed out in the arms of a teammate. An ambulance was called and Anna was rushed to the ER. She had a brief seizure in the ambulance.

* **Scenario #2 (Anna, age 25)**

Anna went on vacation with her friends to an all-inclusive resort. Even though she checked her blood sugar frequently, there were times she forgot to bring her supplies with her down to the beach. She allowed herself to splurge on desserts that were not sugar-free. She even had a few glasses of wine. She noticed that she had to go to the bathroom quite often, but she just assumed that was due to the alcohol. She also drank tons of water throughout the day, but attributed her thirst to the heat and humidity. On the 3rd day of the trip Anna felt like she was getting the flu. By the evening, she was confused and disoriented and was beginning to speak incoherently. Anna took more insulin, but her friends took her to the doctor just to be sure she was OK. Luckily, Anna was given IV fluids and sent home after a few hours.

* **Scenario #3 (Anna, age 29)**

At a wedding, Anna knew she would be consuming more food than she normally ate. She took extra insulin before she got there so she did not have to worry about injections during the reception. She figured the ceremony would be short and she could enjoy snacks at the cocktail hour that followed. Unfortunately, the ceremony went longer than expected and she began to feel a bit dizzy. She immediately drank a juice box that was in her purse and she soon felt back to normal. She stopped to check her blood sugar before the reception just to be sure.

1. Read the Nemours KidsHealth article *When Blood Sugar is Too High* available at <http://kidshealth.org/kid/diabetes_basics/living-diabetes/high_blood_sugar.html#cat20833>
2. Define the term *hyperglycemia* in your laboratory journal. Think about the prefix *hyper* and how it relates to this condition. Under the definition, list common symptoms of hyperglycemia as experienced by a diabetic.
3. Read the Nemours KidsHealth article *When Blood Sugar is Too Low* available at <http://kidshealth.org/kid/diabetes_basics/living-diabetes/low_blood_sugar.html#cat20833>
4. Define the term *hypoglycemia* in your laboratory journal. Think about the prefix *hypo* and how it relates to this condition. Under the definition, list common symptoms of hypoglycemia as experienced by a diabetic.
5. Answer Conclusion question 1.
6. Return to the scenarios presented in Step 2. Using what you have learned in the readings, decide in each case if Anna was hyperglycemic, hypoglycemic, or ultimately unaffected. Write the diagnosis next to the paragraph.

Conclusion

1. Explain the role that exercise plays in maintaining healthy blood sugar levels.
2. How does preventing a diabetic emergency affect the day to day life of a diabetic? What special considerations do they have to make as they go about their day?
3. Research an insulin pump. Explain how having an insulin pump may decrease the chance of a diabetic having a diabetic emergency.