

**Chapter 39 Endocrine and Reproductive Systems****Exploration****Modeling Blood Glucose Regulation**

Regulating the level of blood glucose is one of the body's most important jobs. Two hormones, insulin and glucagon, help to regulate the level of glucose in the blood. Because these two hormones have opposite effects, it is important that a proper balance between them is maintained. In this investigation, you will simulate how this regulatory mechanism works.

**Problem**

How does the body regulate blood glucose levels?

**Materials**

- 3 pieces of construction paper of different colors
- scissors

**Skills** Using Models, Posing Questions**Procedure** 

1. Work in groups of 3 students. Give each member of the group a number from 1 to 3.
2. Cut 15 cards out of construction paper of one color. On each card, print "10 mg glucose/100mL blood" on the front and "glycogen" on the back. These are your glucose cards. Turning over a glucose card represents converting glucose into glycogen, or vice versa.
3. Cut out 2 cards of a second color. On each of these cards print "insulin." Each of these insulin cards can convert 1 glucose card into glycogen.
4. Cut out 2 more cards of a third color. On each of these cards print "glucagon." One glucagon card can convert 1 glucose card from glycogen into glucose.

10 mg glucose/  
100 mL blood

insulin

glucagon

5. Place 9 glucose cards face up on the table. This represents the normal level of glucose in blood (90 mg glucose/100 mL blood). Student 1 should keep 2 more glucose cards face up.
6. Student 2 should keep the insulin and glucagon cards. Student 3 should keep the remaining 4 glucose cards face down, to represent stored glycogen.
7. To simulate the effect of a meal, student 1 should add a glucose card to the 9 on the table. Discuss how the body responds to this change.
8. Students 2 and 3 should use the cards to model how the body restores the normal blood glucose level after a meal. Record your observations in the table below.
9. To simulate the effect of exercise, student 1 should remove a glucose card from the 9 on the table. Repeat step 8, and record your observations.
10. To simulate what happens when a person has Type 1 diabetes, repeat steps 7 and 8 without using the insulin cards. Record your observations again.

Observations	
Step 8	
Step 9	
Step 10	

### Analyze and Conclude

1. **Applying Concepts** What organ does student 2 represent? Explain your answer.

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**2. Using Models** How did students 2 and 3 respond in step 8? In step 9? In step 10? Describe what happens in the body in each situation.

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**3. Applying Concepts** How does this activity model homeostasis in the body?

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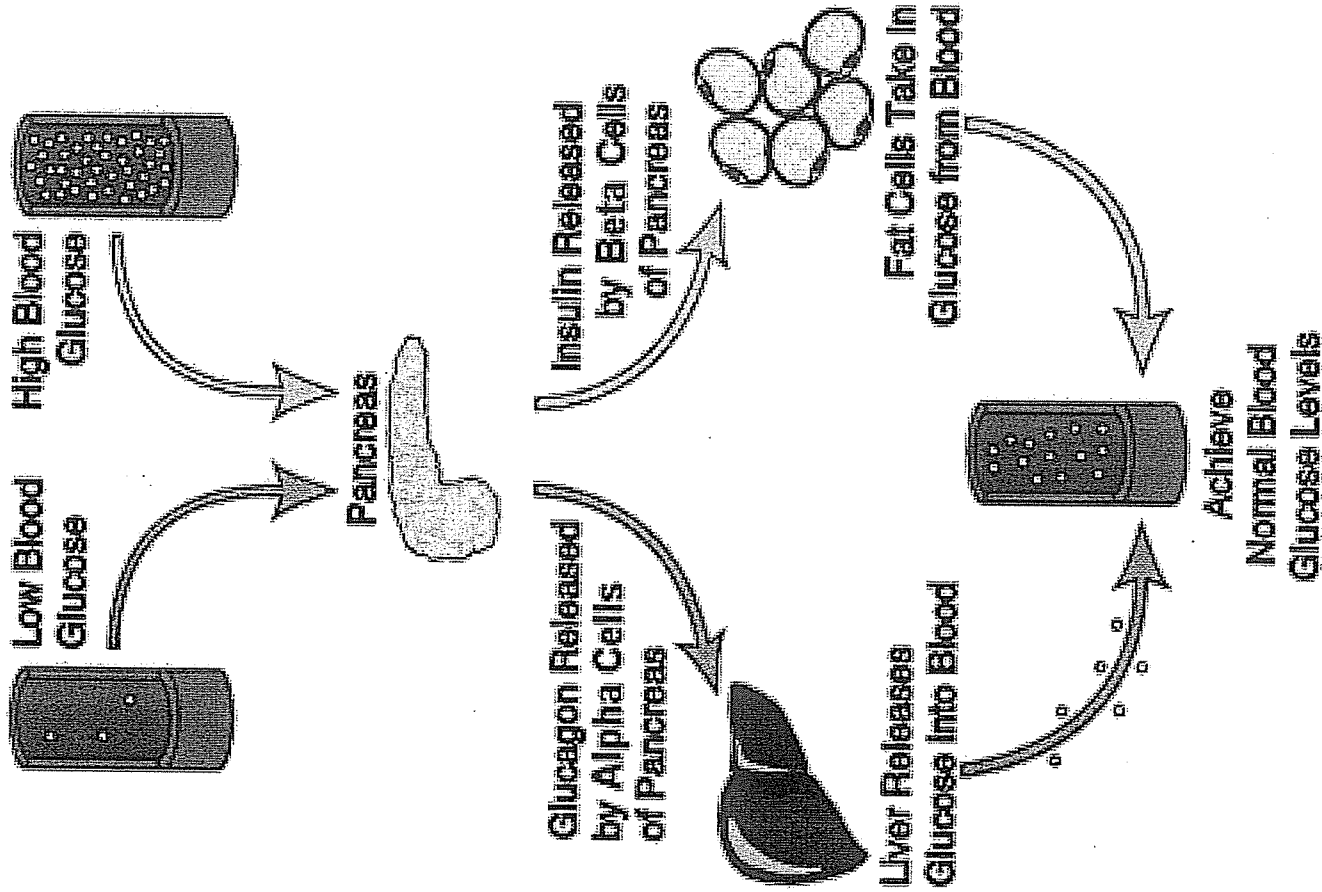
**4. Predicting** What do you think would happen if a person with Type 1 diabetes ate a large amount of sugar?

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The pancreas is an endocrine gland which produces hormones which regulate blood glucose (sugar) levels.

An increase in blood sugar level triggers the release of the hormone insulin by the pancreas.

The hormone insulin lowers blood sugar level restoring the body to its original blood glucose level in two major ways:

it increases the ability of body cells to take in glucose from the blood

it converts blood glucose to the compound glycogen