

Name \_\_\_\_\_

Course/Section \_\_\_\_\_

Date \_\_\_\_\_

Professor/TA \_\_\_\_\_



### Activity 45.1 How do hormones regulate cell functions?

This activity is designed to help you understand how hormones act within cells to produce a response.

#### Building the Model

Working in groups of three or four, construct a dynamic (claymation-type) model of hormone action in cells. You may use the materials provided in class or devise your own.

**Step 1.** Use chalk on a tabletop or blackboard to draw a eukaryotic cell. Your cell should be at least 18 inches in diameter. Be sure your drawing includes the cell membrane, the nuclear membrane, and the DNA inside the nucleus.

Assume that your eukaryotic cell responds to two different hormones:

- Hormone 1 is a protein-derived hormone. The cell responds to hormone 1 by increasing production of substance X.
- Hormone 2 is a cholesterol-derived hormone. The cell responds to hormone 2 by decreasing production of substance Y.

**Step 2.** Answer the following questions.

1. What structures or components do you need to add to your model to allow hormone 1 to react and increase production of substance X?
2. What structures or components do you need to add to your model to allow hormone 2 to decrease production of substance Y?

Now use playdough or cutout pieces of paper to make your hormones, cell membrane proteins, and any other proteins you need. Indicate their placement on the membrane or cell. Include a key for your model that indicates how different hormones and proteins are designated.

**Step 3.** Using claymation, demonstrate how each of the two hormones is likely to produce its response.

**Use the understanding you gained from your model to answer the questions.**

3. In medical applications, the type of hormone dictates the mode of administration—for example, oral versus injection, and so on.

a. How would you need to administer hormone 1 to an organism deficient in this hormone?

b. How would you need to administer hormone 2?

4. Hormones often act in an antagonistic fashion. That is, one hormone will initiate a certain response while another inhibits that response. Illustrate this process using insulin and glucagon as examples of antagonistic hormones.

Name \_\_\_\_\_

Course/Section \_\_\_\_\_

### 45.1 Test Your Understanding

1. Assume you are trying to characterize one of the hormones that is involved in the neuroendocrine regulation of milk production. You make extracts of blood and mammary tissues of normal, lactating (milk-producing) animals and assay these extracts by injecting them into animals (each of whose hypothalamus has been surgically removed) and look for restoration of milk production. Indicate whether each of the following findings is consistent with the hormone being a steroid, a peptide, or either type. Explain your reasoning.
  - a. The hormone is found in blood.
  - b. It is found in the cytoplasm of mammary tissue cells.
  - c. It is found associated with receptors.
  - d. It is found associated with protein complexes that contain G protein.
  - e. It is found in nuclear extracts of cells.
  
- 2 to 4. Glucagon and insulin are hormones that act homeostatically to maintain glucose levels in the body. Are the following statements **True** or **False** concerning insulin and glucagons? Explain your reasoning.
  - T/F 2. Their production and release is stimulated by trophic hormones from the anterior pituitary.
  - T/F 3. They are examples of antagonistic hormones.
  - T/F 4. They act by stimulating storage or release of glucose from cells.