Section 10.1: Hormones: Chemical Regulators

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1. A hormone is a chemical that is produced in one part of the body that regulates a process in another part of the body.

2. The two most common types of hormones are protein hormones and steroid hormones. Protein hormones are chains of amino acids. Steroid hormones are derived from cholesterol and lipids with four fused carbon rings.

3. Some hormones (protein hormones) bind with receptor molecules on the cell membrane, while other hormones (steroid hormones) pass through the membrane and bind to receptor molecules inside the cell, either in the cytosol or in the nucleus.

4. Hormones only produce effects in specific target cells that contain the correct receptor molecules for that hormone. Only the cells of the face would have the necessary receptors and would grow hair.

5. Answers will vary. Sample answer:

6. Since it is derived from cholesterol, it is a steroid hormone and should use an internal receptor mechanism, passing through the lipid bilayer plasma membrane and activating a receptor molecule inside the cell’s cytosol or nucleus.

7. Answers may vary according to the hormone students chose to illustrate. Answers should include the cell tissue and cell type that produces the hormone, the hormone’s target cell, the type of hormone (protein or steroid), and its action on target cell function.

8. Answers may vary. Reports should include: Calcitonin is being used clinically in osteoporosis therapy for both men and women. The hormone used is either recovered from salmon or produced by genetic engineering. Calcitonin also shows promise for other clinical applications, including treating phantom limb pain (pain that seems to come from a now-amputated limb) and treating pain associated with cancer that has spread to bone.

9. The imbalance of a particular hormone affects the entire body and causes so many symptoms because a hormone may have many target cells in different parts of the body.

10. Steroid hormones can diffuse into a cell while protein hormones cannot because plasma membranes have a phospholipid bilayer, which allows lipid-soluble steroid hormones to pass through.
11. | **Steroid hormones** | **Protein hormones** |
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<td>(a) diffuse through plasma membrane</td>
<td>bind to a receptor on plasma membrane</td>
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<td>(b) bind to receptor within the cell</td>
<td>stimulate second messengers within the cell</td>
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<td>(c) hormone and receptor complex enters the nucleus and binds to DNA</td>
<td>second messenger starts a series of chemical reactions within the cytosol.</td>
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<td>(d) directly cause DNA to make proteins</td>
<td>second messengers activate enzymes</td>
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12. When hormone levels reach a normal or necessary amount, further secretion is controlled by important body mechanisms to maintain that level of hormone in the blood. This regulation of hormone secretion may involve the hormone itself or another substance in the blood related to the hormone. For example, if the thyroid gland has secreted adequate amounts of thyroid hormones into the blood, the pituitary gland senses the normal levels of thyroid hormone in the bloodstream and adjusts its release of thyrotropin, the pituitary hormone that stimulates the thyroid gland to produce thyroid hormones. When less thyrotropin is available, the thyroid gland stops or slows production of thyroid hormone.