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SIGNAL TRANSDUCTION AND G PROTEIN-COUPLED RECEPTORS

REVIEW THE CONCEPTS

1. Extracellular signals are made by signaling cells. Receptor proteins are present in target cells. Binding of extracellular signaling molecules to cell-surface receptors triggers a conformational change in the receptor, which in turn leads to intracellular signal-transduction pathways that ultimately modulate cellular metabolism, function, or gene expression. Intracellular signal transduction pathways are evolutionarily highly conserved.

2. Endocrine, paracrine, and autocrine signaling differ according to the distance over which the signaling molecule acts. In endocrine signaling, signaling molecules are released by a cell and act on target cells at a distance. In animals, the signaling molecule is carried to target cells by the blood or other extracellular fluids. In paracrine signaling, the signaling molecules are released and affect only target cells in close proximity. In autocrine signaling, the cell that releases the signaling molecule is also the target cell. Growth hormone is an example of endocrine signaling because the growth hormone is synthesized in the pituitary, located at the base of the brain, and travels to the liver via the blood.

3. The ligand-receptor complex that shows the lower K_d value has the higher affinity. Because the K_d for receptor 2 (10^{-9} M) is lower than that for receptor 1 (10^{-7} M), the ligand shows greater affinity for receptor 2 than for receptor 1. To calculate the fraction of receptors with bound ligand, $[RL]/R_T$, use Equation 15-2 $[RL]/R_T = 1/(1 + K_d/[L])$. For receptor 1, the K_d is 10^{-7} M and the concentration of free ligand [L] is 10^{-8} M. Thus, the $[RL]/R_T$ for receptor 1 is 0.091, that is, only 9% of the receptors