Learning Outcomes
1. List hormones produced by each of the endocrine glands, and discuss their target organs and general functions.
2. Describe major pathological consequences of hypersecretion and hyposecretion of the hormones considered in this chapter.

The Endocrine System
• Second control system of the body
• Helps nervous system control body processes
• Uses chemical messages (hormones) that are released into the blood
• Hormones control several major processes
  • Reproduction
  • Growth and development
  • Mobilization of body defenses
  • Maintenance of homeostasis of blood – water, electrolyte, nutrient
  • Regulation of metabolism and energy balance

Hormone Overview
• Hormones are produced by specialized cells
• Cells secrete hormones into extracellular fluids
• Blood transports hormones to target sites
• These hormones regulate the activity of other cells

The Chemistry of Hormones
• Amino acid-based hormones
  • Proteins
  • Peptides
  • Amines
• Steroids – made from cholesterol
• Prostaglandins – made from highly active lipids
  • Locally-acting hormones
Mechanisms of Hormone Action
• Hormones affect only certain tissues or organs (target cells or organs)
  • Target cells must have specific protein receptors in order to bind the hormone
  • Hormone binding influences cell behavior/function

Effects Caused by Hormones
• Changes in plasma membrane permeability or electrical state
  • By opening or closing ion channels
• Turn transcription of certain genes on or off
  • If on, results in protein production
• Activation or inactivation of enzymes
• Stimulation or inhibition of mitosis
• Promote or inhibit secretion of a product

Mechanisms of Hormone Action
• 2 ways hormones cause their effects
  • Direct gene activation
    • Steroid hormone and thyroid hormone – lipid soluble
    • Communicate directly with receptor inside nucleus
  • Second-messenger system
    • Protein and peptide hormones – water soluble – cannot go through membrane directly
    • Some steroid hormones can use this pathway also
      • Bind surface receptor on target cell, 2nd messenger communicates with nucleus (like cAMP)

Mechanism of Hormone Action
• Control of Hormone Release
  • Hormone levels in the blood are maintained by negative feedback
    • A stimulus or low hormone levels in the blood triggers the release of more hormone
    • Hormone release stops once an appropriate level in the blood is reached
  • 3 types of stimuli for hormone release
    • Hormonal
    • Humoral
    • Neural

Hormonal Stimuli of Endocrine Glands
• Endocrine glands are activated by other hormones
Humoral Stimuli of Endocrine Glands

- Changing blood levels of certain ions stimulate hormone release

Neural Stimuli of Endocrine Glands

- Nerve impulses stimulate hormone release
- Most are under control of the sympathetic nervous system

Location of Major Endocrine Organs