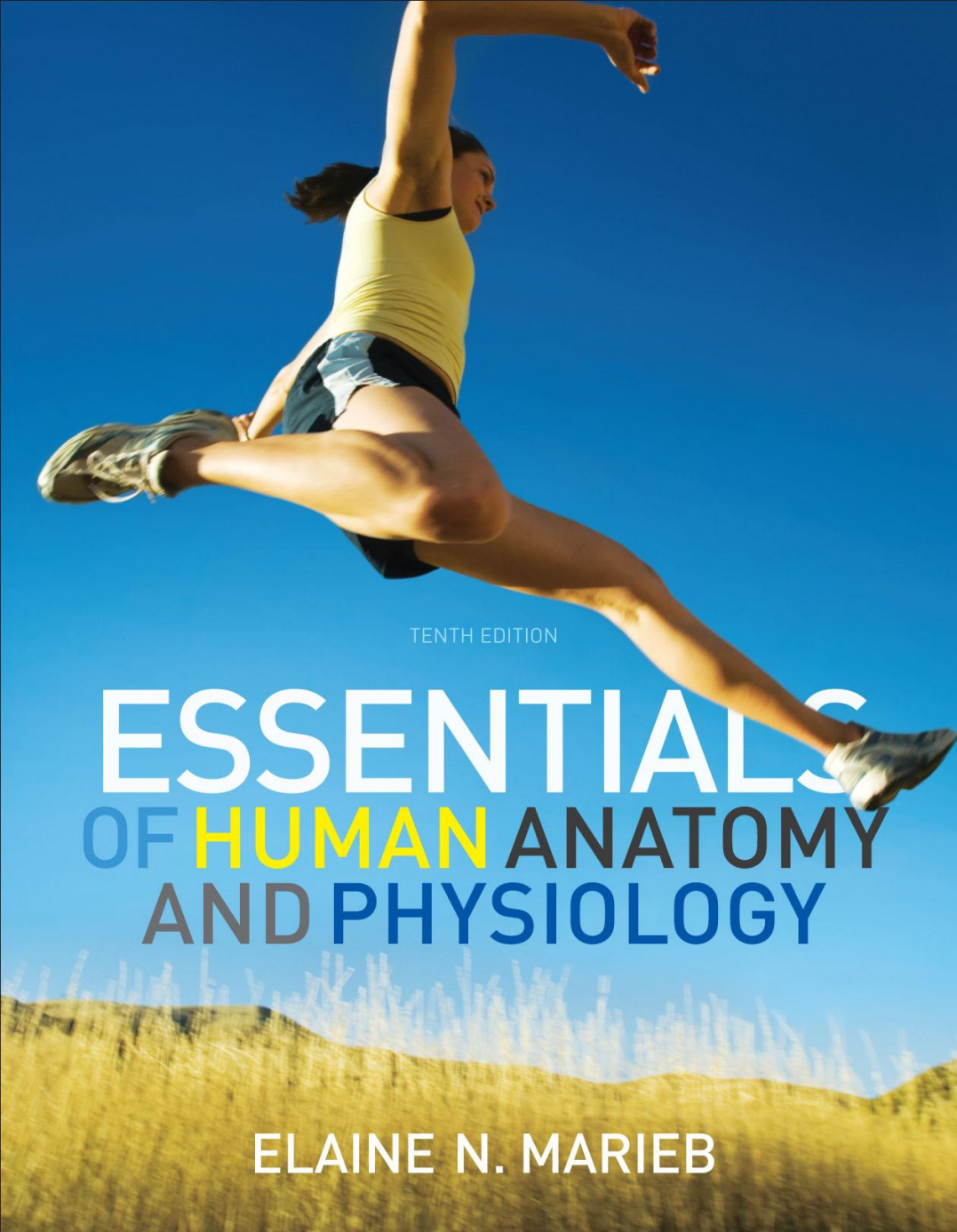


## PowerPoint® Lecture Slides

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# CHAPTER 9

## The Endocrine System



TENTH EDITION

# ESSENTIALS OF HUMAN ANATOMY AND PHYSIOLOGY

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# The Endocrine System

- Second controlling system of the body
  - Nervous system is the fast-control system
- Uses chemical messengers (hormones) that are released into the blood
- Hormones control several major processes:
  - Reproduction
  - Growth and development
  - Mobilization of body defenses
  - Maintenance of much of homeostasis
  - Regulation of metabolism

# Endocrine System

- [https://www.youtube.com/watch?v=gjmS4\\_7kvDM](https://www.youtube.com/watch?v=gjmS4_7kvDM)

# Hormone Overview

- Hormones are produced by specialized cells
- Cells secrete hormones into extracellular fluids
- Blood transfers hormones to target sites
- The hormones then regulate the activity of other cells (aka target cells)

# The Chemistry of Hormones

- Hormones are classified chemically as
  - **Amino acid** – based, which includes
    - Proteins
    - Peptides
    - Amines
  - **Steroids** — made from cholesterol
  - **Prostaglandins** — made from highly active lipids

# Mechanisms of Hormone Action

- Hormones affect only certain tissues or organs (target cells or target organs)
- Target cells must have specific protein receptors
- Hormone-binding alters cellular activity

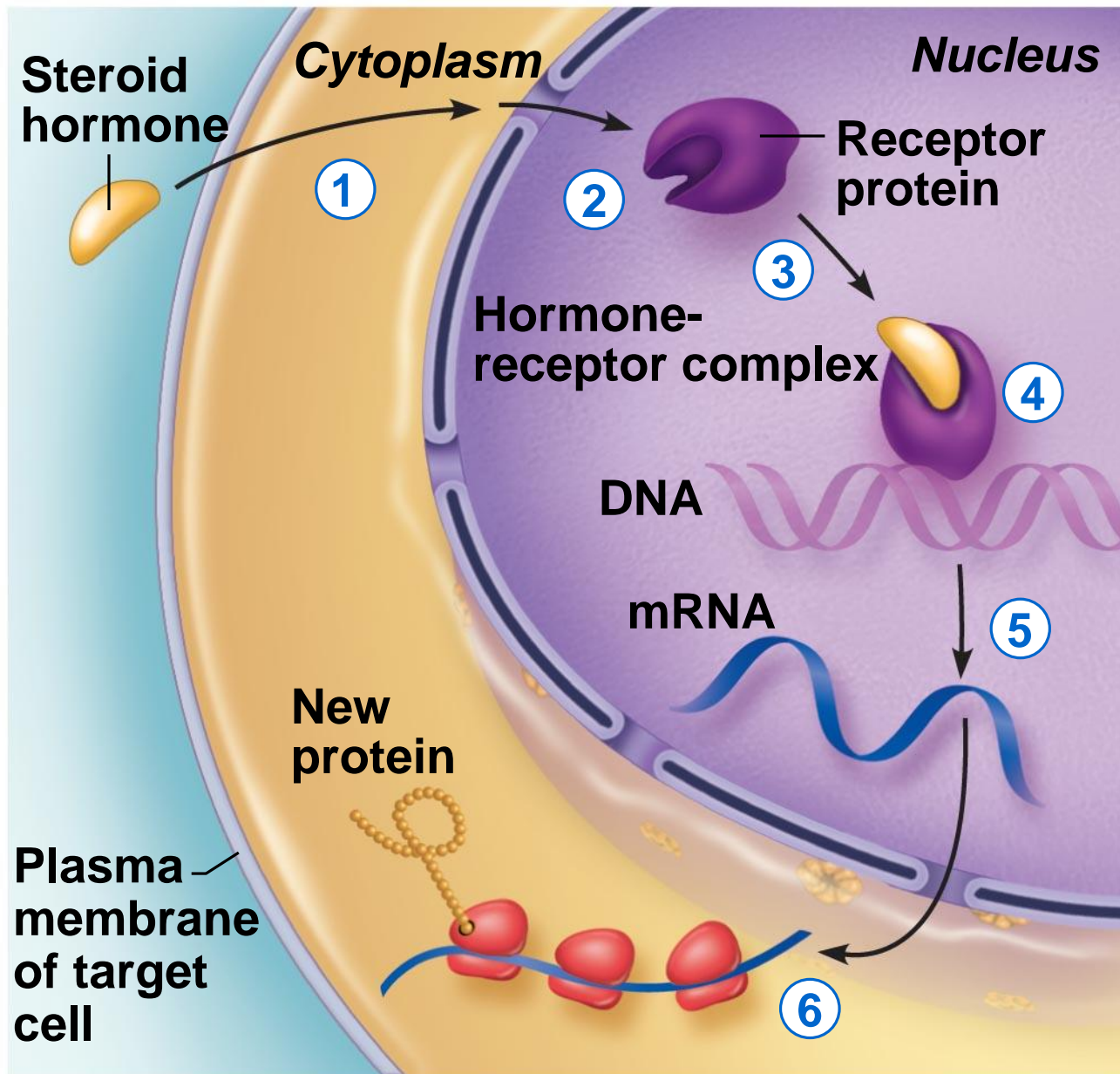
# Effects Caused by Hormones

- (1) Changes in plasma membrane permeability or electrical state
- (2) Synthesis of proteins, such as enzymes
- (3) Activation or inactivation of enzymes
- (4) Stimulation of mitosis
- (5) Promotion of secretory activity

# The Chemistry of Hormones

- Two mechanisms in which hormones act
  - I. Direct gene activation
  - II. Second-messenger system



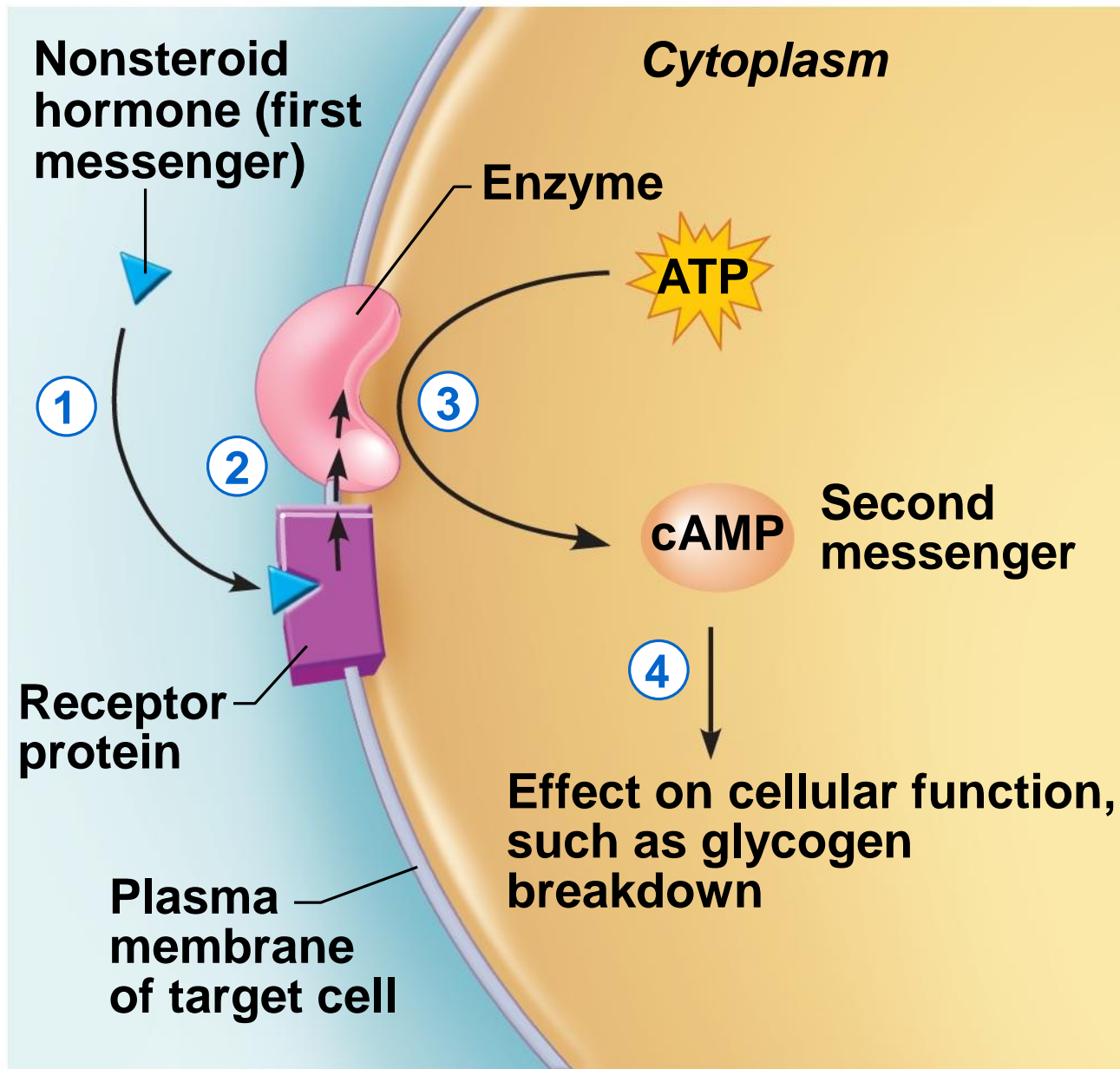


**(a) Steroid hormone action**

**Figure 9.1a**

# I. Direct Gene Activation (Steroid Hormone Action)

- <https://www.youtube.com/watch?v=Nm9u4INCPyM>



**(b) Nonsteroid hormone action**

**Figure 9.1b**

## **II. Second-Messenger System (Non-steroid Hormone Action)**

- <https://www.youtube.com/watch?v=Nt2r5R0ZO5U>

# Control of Hormone Release

- Hormone levels in the blood are mostly 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

# Hormonal Negative Feedback

- <https://www.youtube.com/watch?v=RycF0ub2AI0>

# Exocrine vs. Endocrine

- Exocrine:
  - secretes products by ducts externally to itself (outside the organ or body)
    - pancreas, sweat, liver, mammary
- Endocrine:
  - release products directly into the blood stream
    - pancreas, and the following . . .

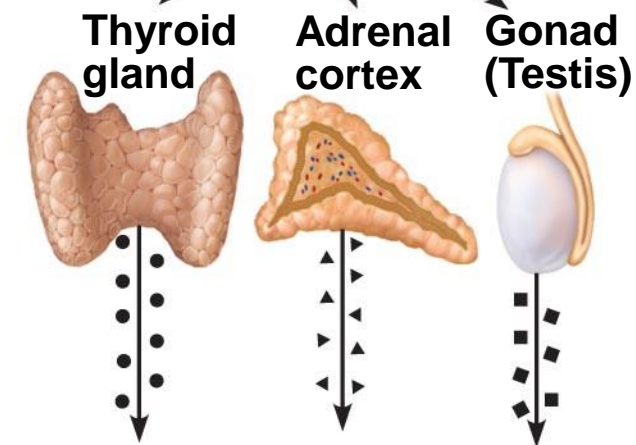
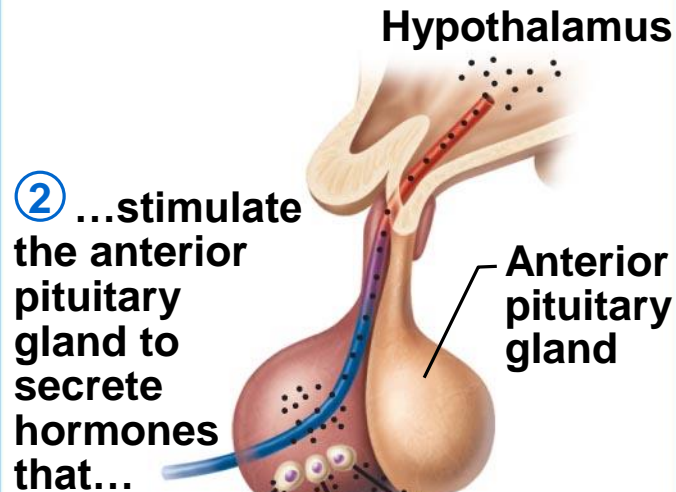
# (a) Hormonal Stimuli of Endocrine Glands

- Most common stimuli
- Endocrine glands are activated by other hormones
- **Examples:**
  - Anterior pituitary hormones travel to target glands, such as the thyroid gland, to prompt the release of a particular hormone, such as thyroid hormone



## (a) Hormonal stimulus

- ① The hypothalamus secretes hormones that...



- ③ ...stimulate other endocrine glands to secrete hormones

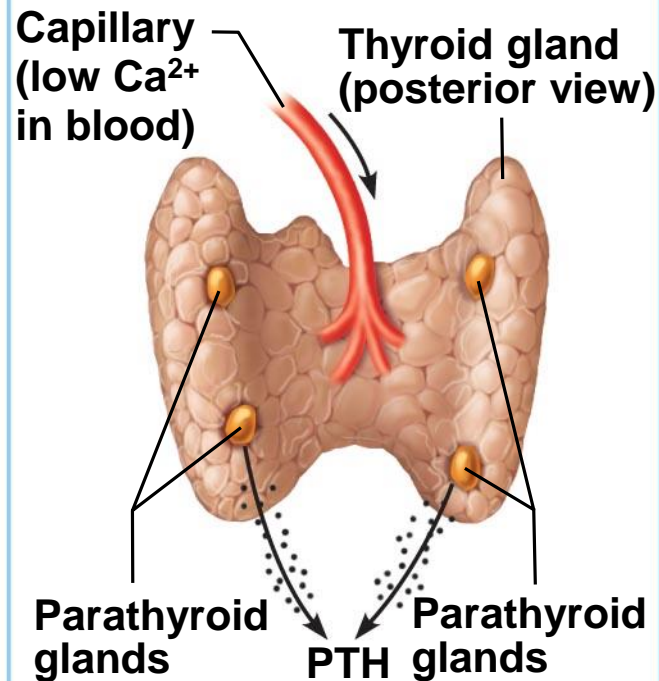
Figure 9.2a

## (b) Humoral Stimuli of Endocrine Glands

- Changing blood levels of certain ions stimulate hormone release
  - *Humoral* indicates various body fluids such as blood and bile
- **Examples:**
  - **Parathyroid** hormone and **calcitonin** are produced in response to changing levels of blood calcium levels
  - **Insulin** is produced in response to changing levels of blood glucose levels

## (b) Humoral stimulus

① Capillary blood contains low concentration of  $\text{Ca}^{2+}$ , which stimulates...



② ...secretion of parathyroid hormone (PTH) by parathyroid glands

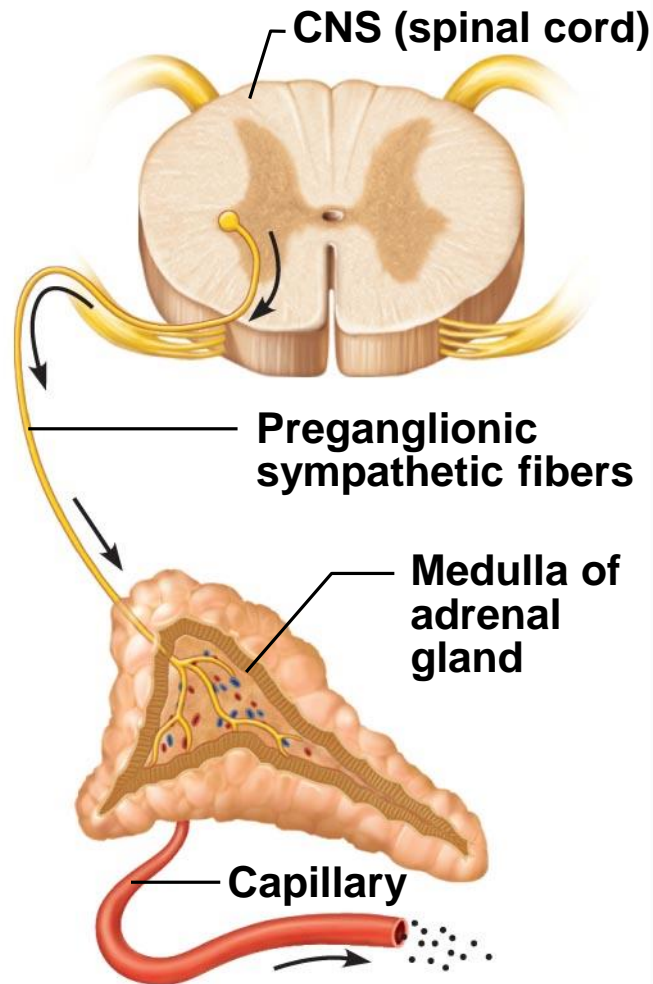
Figure 9.2b

## (c) Neural Stimuli of Endocrine Glands

- Nerve impulses stimulate hormone release
- Most are under the control of the sympathetic nervous system
- **Examples:**
  - The release of norepinephrine and epinephrine by the adrenal medulla

### (c) Neural stimulus

- ① Preganglionic sympathetic fiber stimulates adrenal medulla cells...



- ② ...to secrete catecholamines (epinephrine and norepinephrine)

Figure 9.2c