Adrenal Medulla Gland

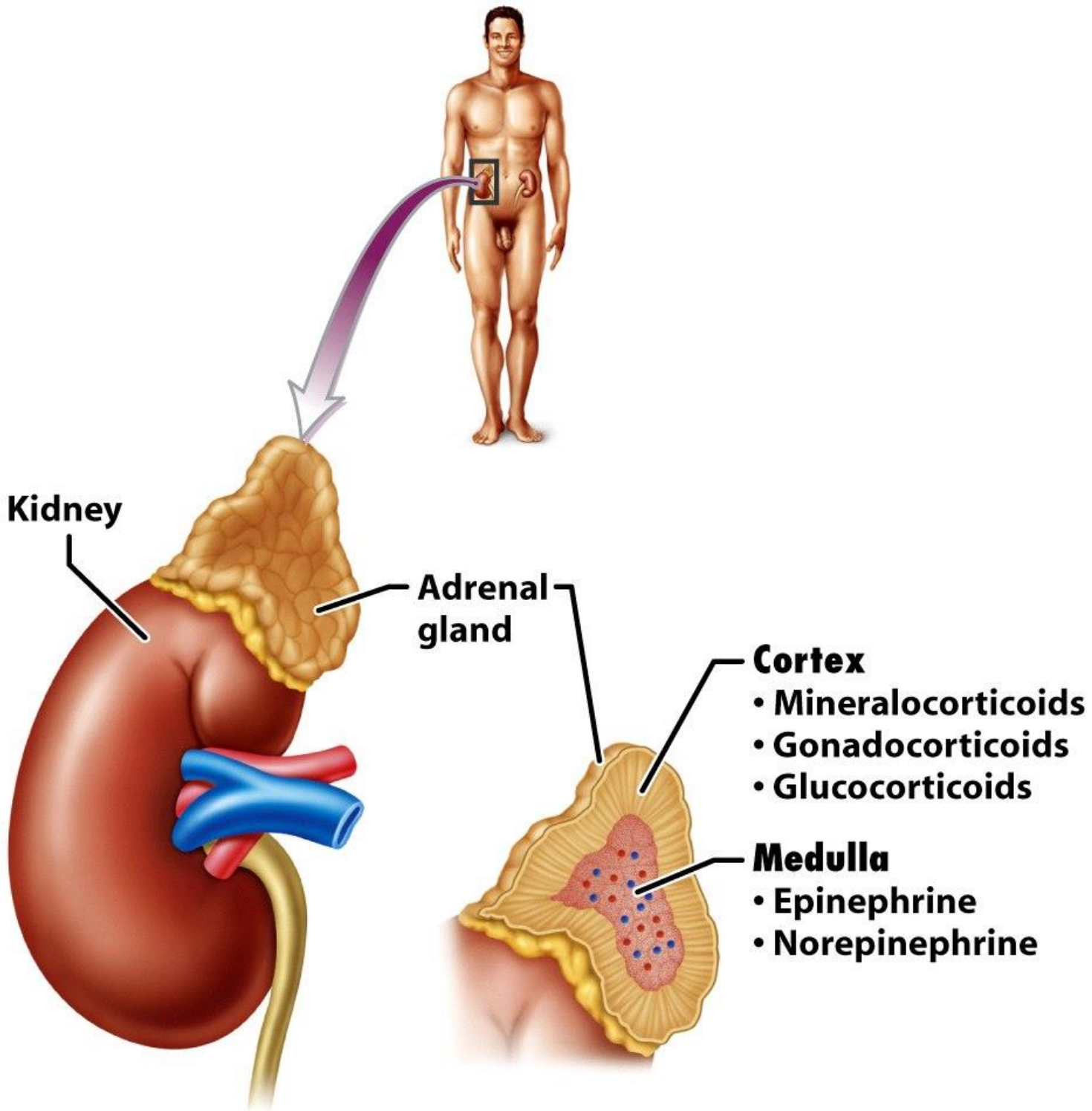
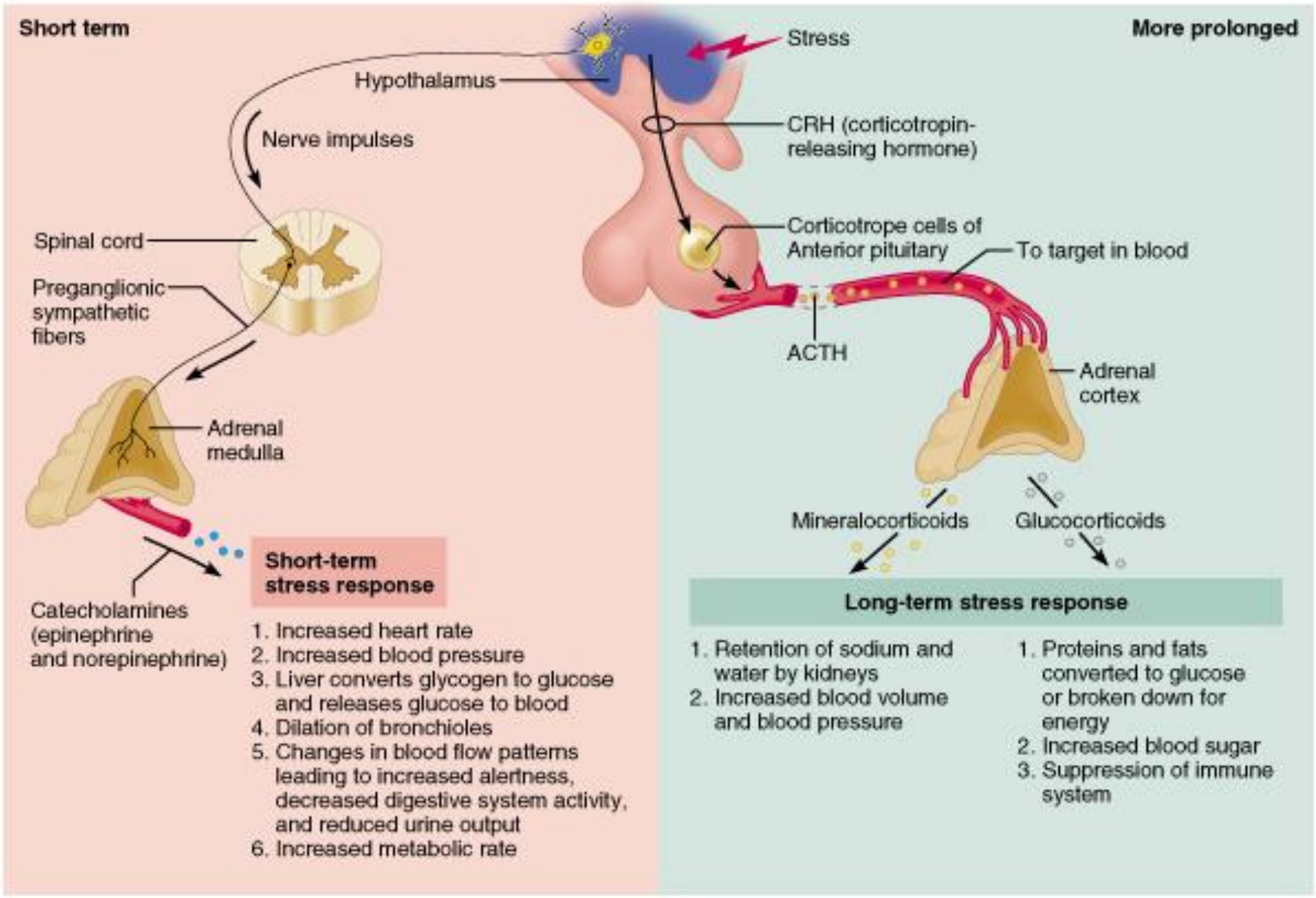


Figure 10-17 Biology of Humans, 2/e

Adrenal Glands: Medulla

- Adrenal medulla: neuroendocrine organ
  - Secretion: sympathetic nervous system
  - Hormones: nonsteroidal
    - Epinephrine and Norepinephrine secreted in response to emergency (short-term) stress (i.e., fight or flight response)

Adrenal Gland's Response to Stress



Pancreas

- The pancreas is both an endocrine gland and an exocrine gland

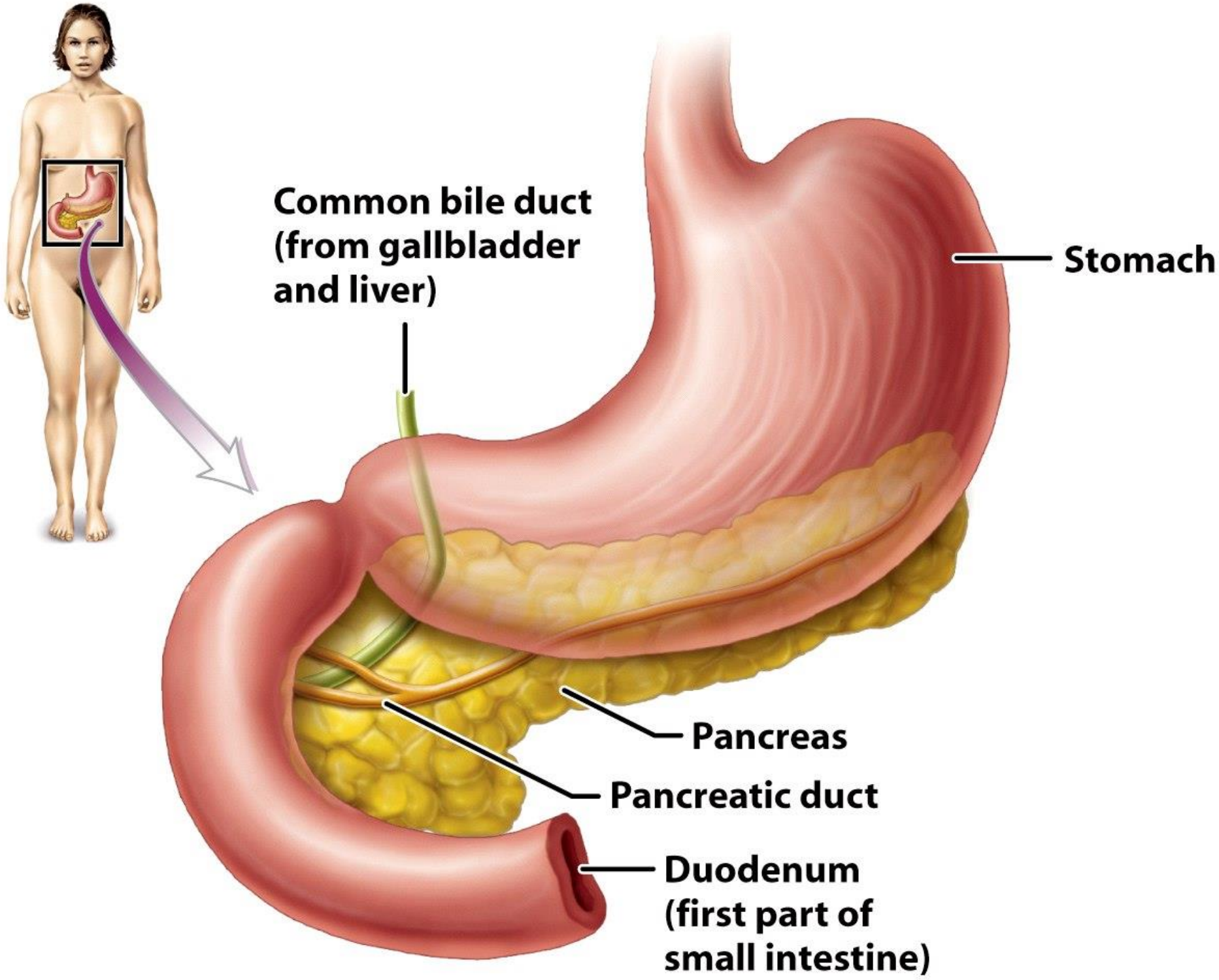


Figure 10-19a Biology of Humans, 2/e

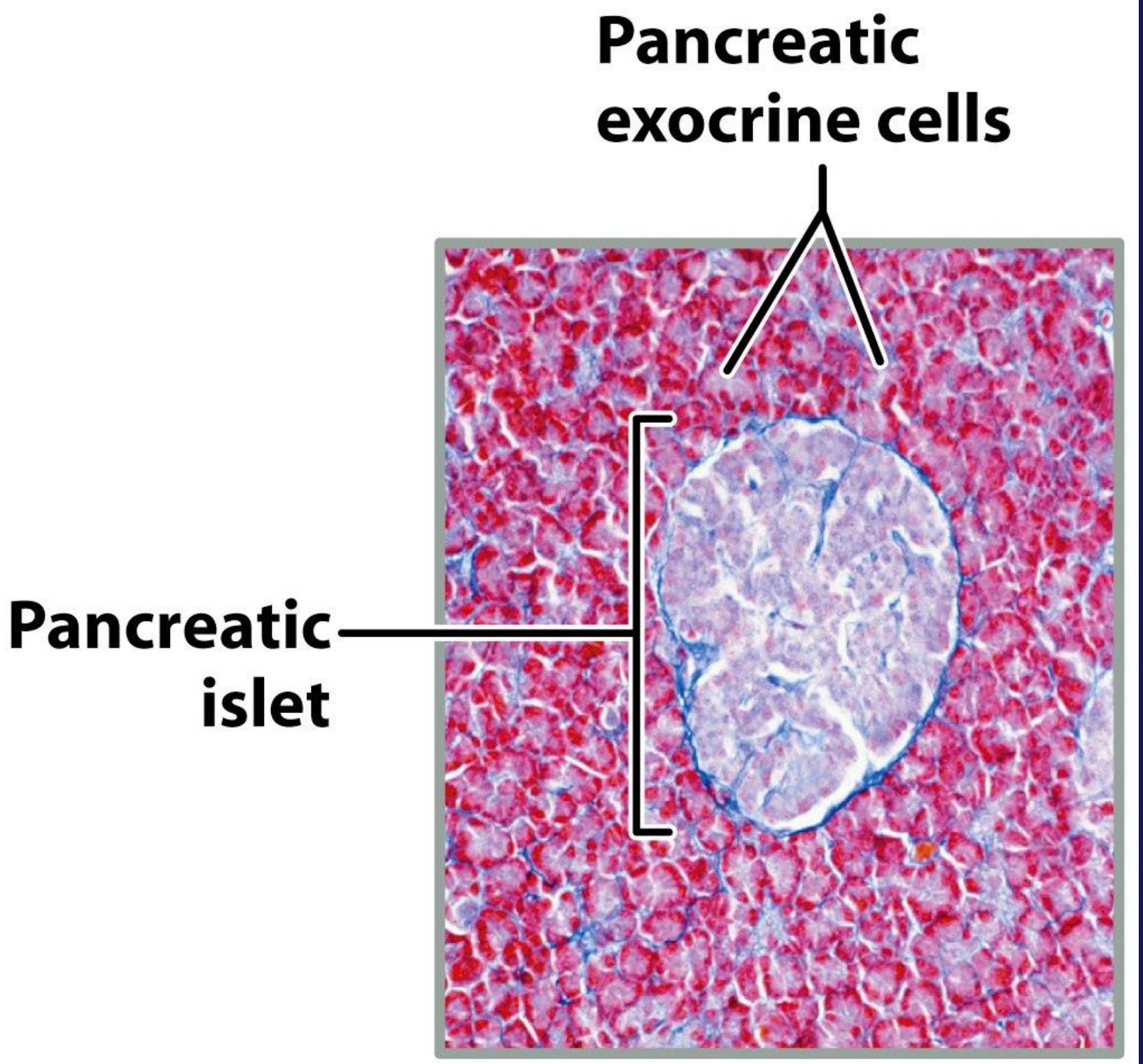


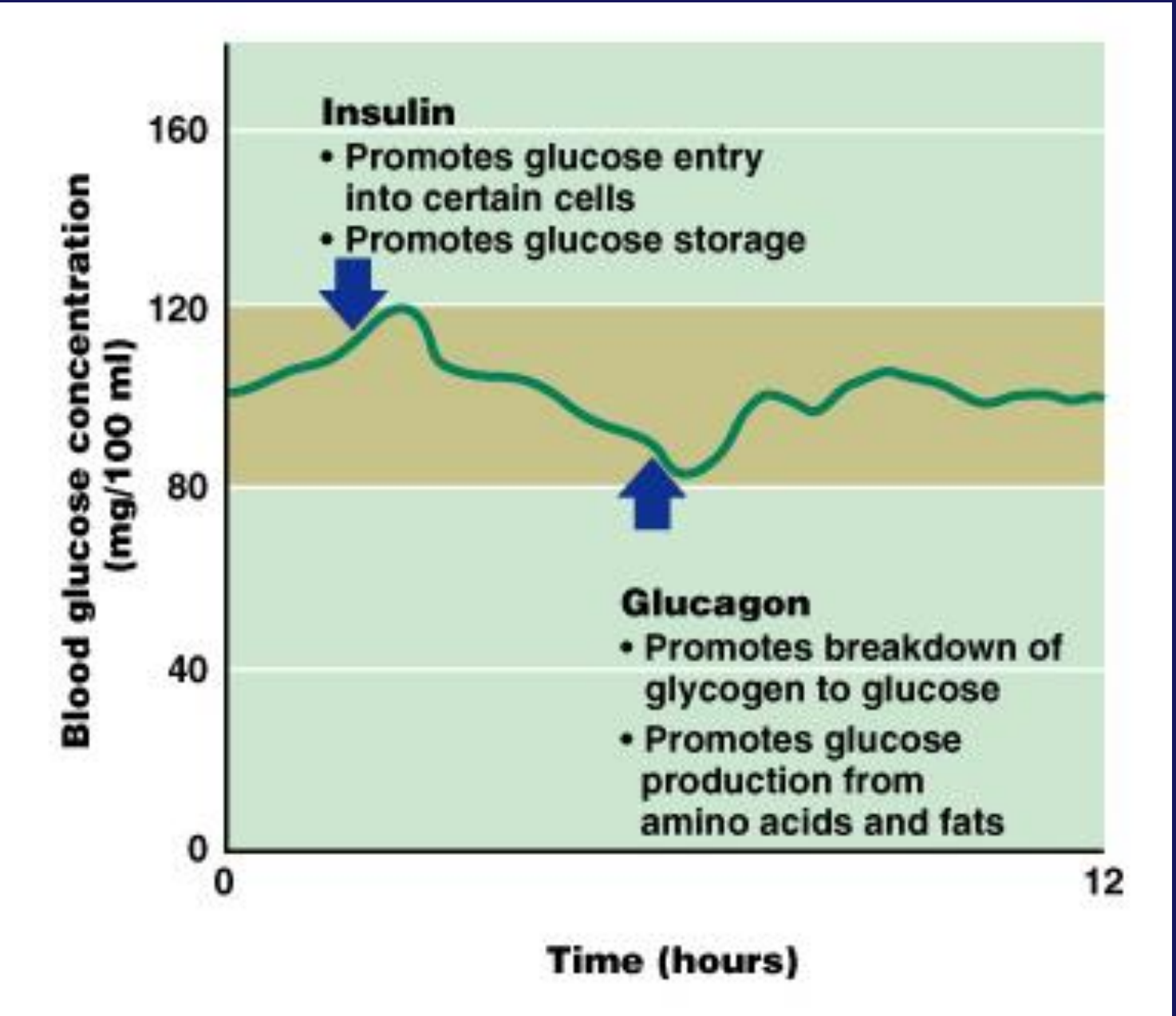
Figure 10-19b Biology of Humans, 2/e

Pancreas: Endocrine Functions

- Structures: pancreatic islets (of Langerhans)

- Hormones: Both protein
  - Insulin: lowers blood sugar
  - Glucagon: raises blood sugar

Roles of Insulin and Glucagon in Regulating Blood Glucose



Metabolic Effects of Insulin

- **Insulin *Stores Food***
  - **Increases glucose uptake into cells**
  - **Decreases blood glucose**
  - **Increases glycogen & fat synthesis**

Diabetes Mellitus

- Diabetes mellitus is a metabolic disorder characterized by an abnormally high level of glucose in the blood

Diabetes Mellitus: Type 1

- Insulin dependent (juvenile onset)
- Lack of insulin; requires daily injections
- ***Type 1 diabetes mellitus*** is an autoimmune disease whereby a person's own immune system attacks the cells of the pancreas responsible for insulin production

Type 1 Diabetes Mellitus

- Acute symptoms of severe insulin deficiency
  - **Glucose cannot cross cell membrane →**
  - **High glucose in blood, and**
  - **Low glucose inside cell →**
  - **Excessive bkdn. of body fat & protein →**
  - **Increased acids in blood →**
  - **Mental disorientation →**
  - **Coma**

Insulin Shock & Hypoglycemia

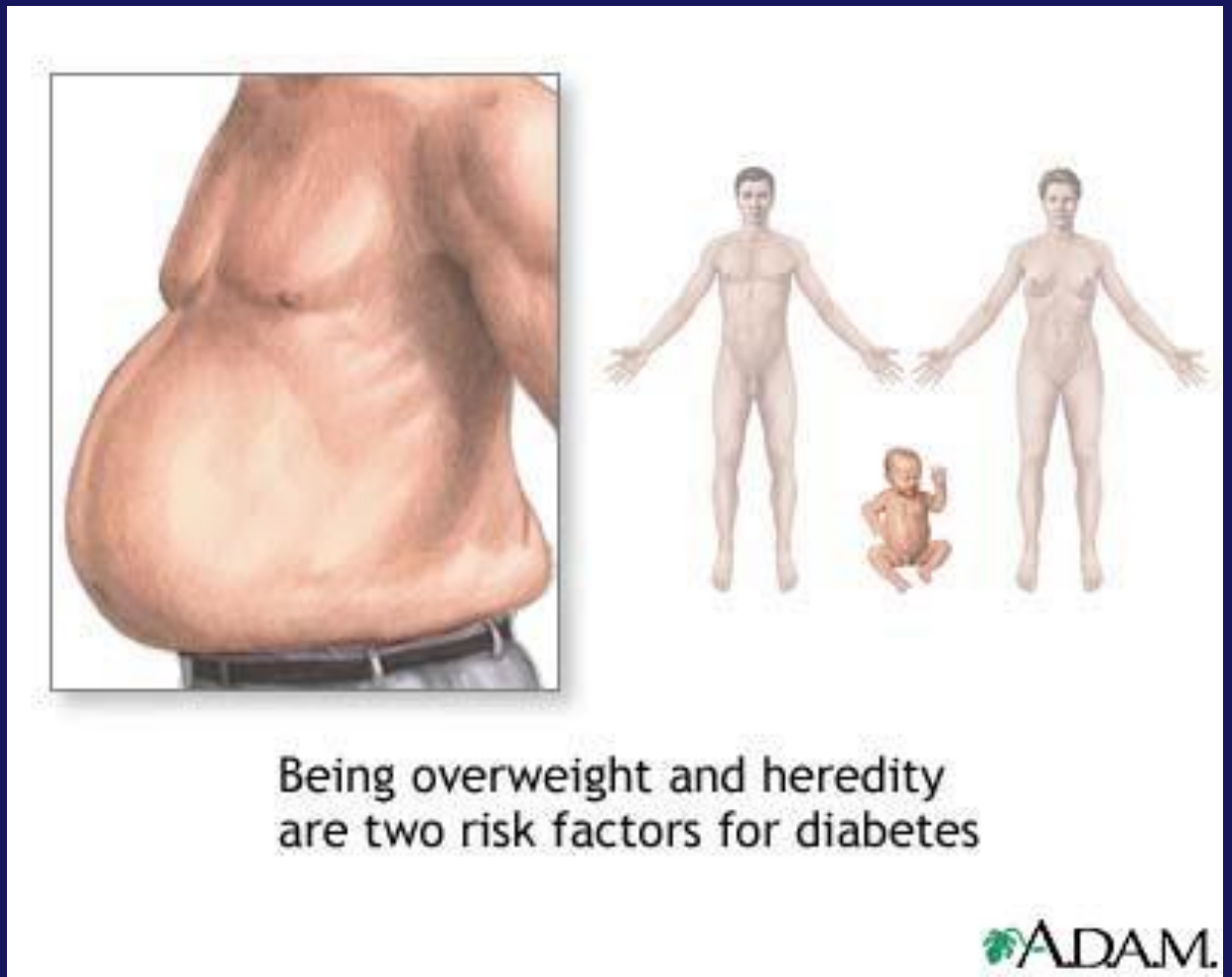
- Typically induced by overdose of insulin
- Blood glucose levels too low →
- Little glucose available to brain cells
- Symptoms:
  - Extreme nervousness/trembling
  - Sweating
  - Hallucinations
  - Loss of consciousness
  - Seizure/Coma → Death

Diabetes Mellitus

- ***Type 2 diabetes mellitus*** is characterized by a decreased sensitivity to insulin

Type 2 Diabetes

- Stereotypical patient: middle aged, under-exercised, Obese (especially visceral obesity)



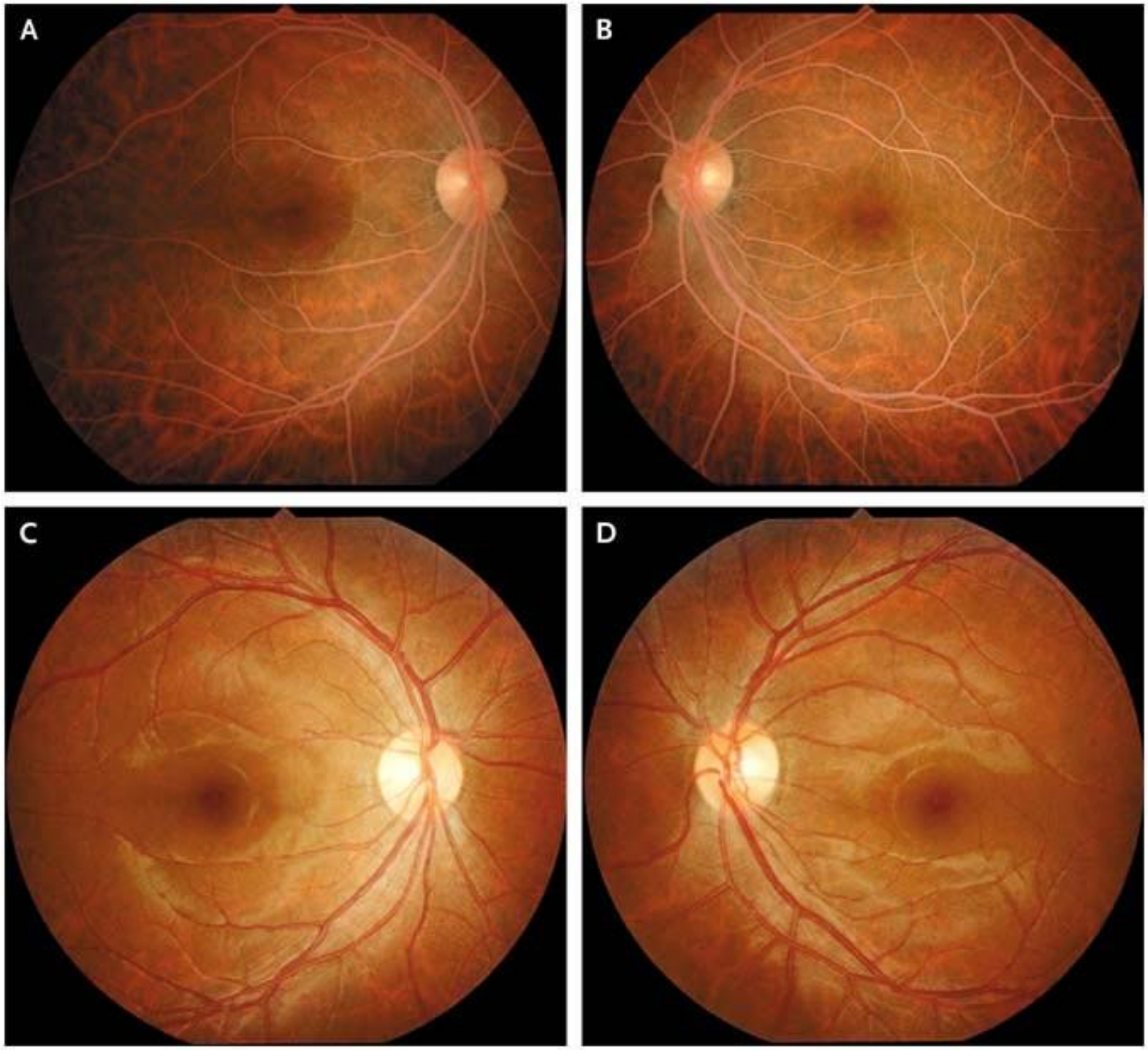
Type 2 no longer confined to older Americans

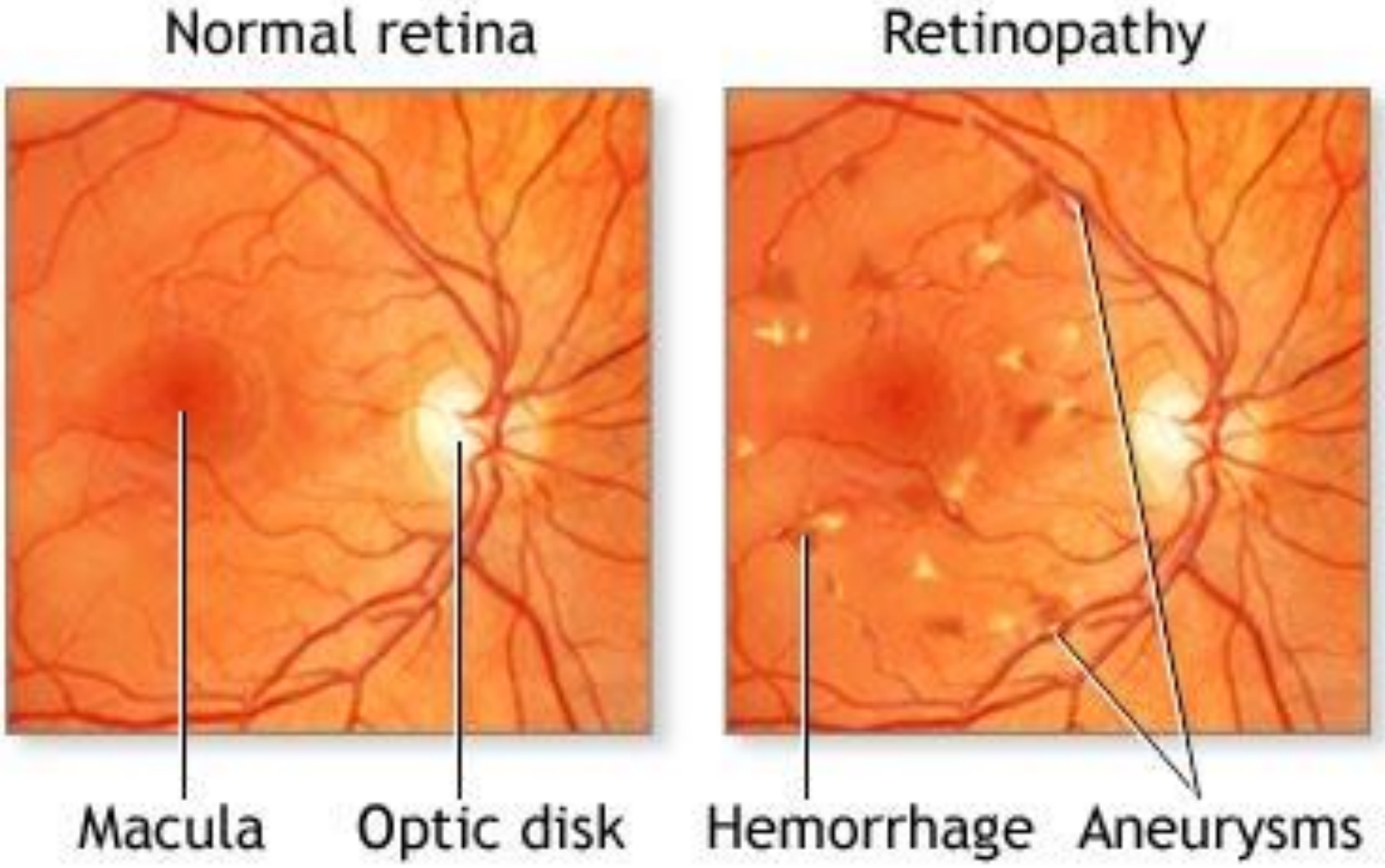
Cardiovascular Problems in Diabetes

- **Hyperlipemia (high serum lipid levels)**
- **High blood cholesterol**

- **Atherosclerosis**
  - **↑ coronary artery disease**
  - **↑ myocardial infarction**

- **Poor blood circulation**


A
B
C
D


Normal retina
Retinopathy
Macula
Optic disk
Hemorrhage
Aneurysms

Type 2 Diabetes Mellitus

- Non-insulin dependent (maturity onset?)
- Cause: Insulin resistance (not lack of insulin)
  - Cells don’t respond adequately to insulin
  - Reason for lack of response unclear
- Control: diet, exercise, drugs, insulin


A
B
C
D

Hormones That ↑ Blood Glucose

- Glucagon – Between meals
- Growth Hormone - Exercise and Growth
- Glucocorticoids – Stress, Starvation
- Epinephrine – Emergency

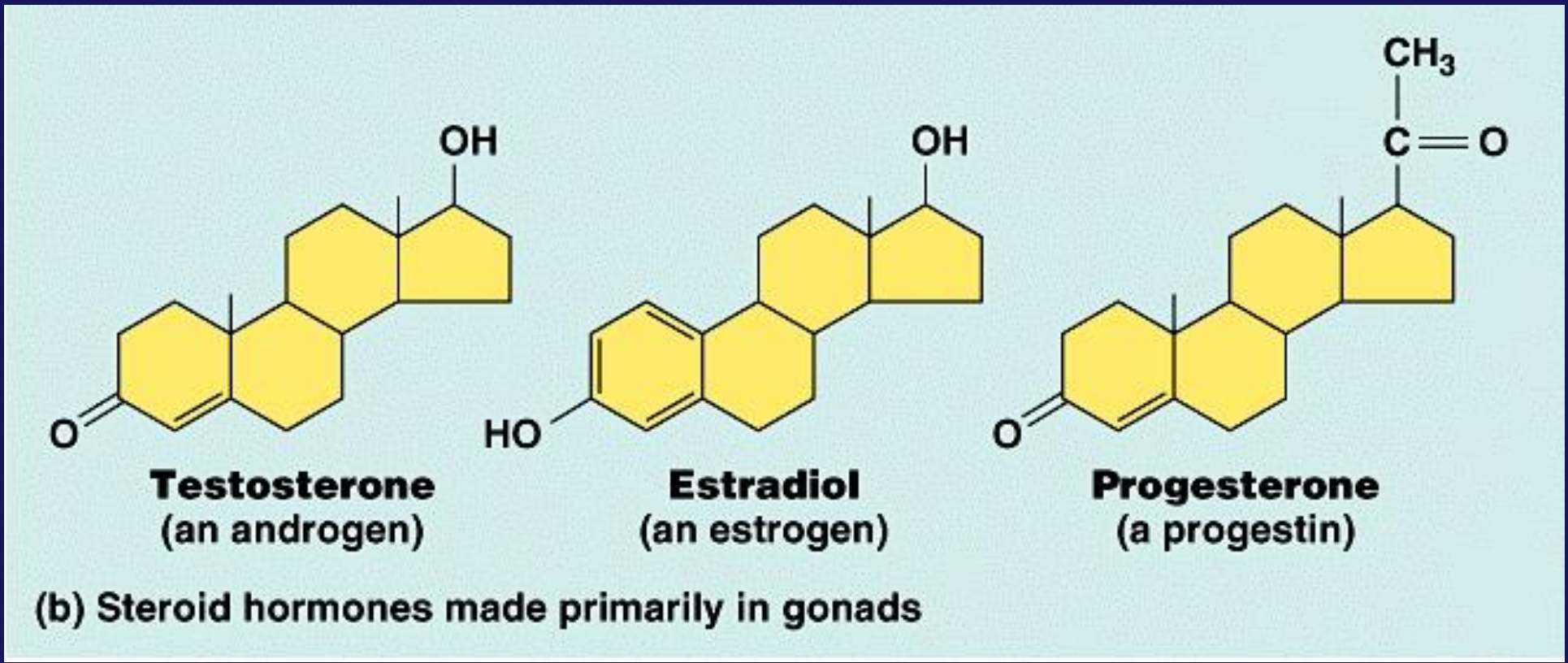
- Note! Insulin is the only hormone that <u>decreases</u> blood glucose

People with uncontrolled diabetes mellitus have

A. High blood glucose
B. Low blood glucose

Testes

- **Testosterone (steroidal)**
  - **Functions:**
    - **Regulates development and normal functioning of:**
      - **Sperm production**
      - **male reproductive organs**
      - **male sex drive**
    - **Development of male secondary sex characteristics (beard growth, etc.)**
    - **Increases muscle and decreases fat**



(b) Steroid hormones made primarily in gonads

Anabolic Steroid Abuse

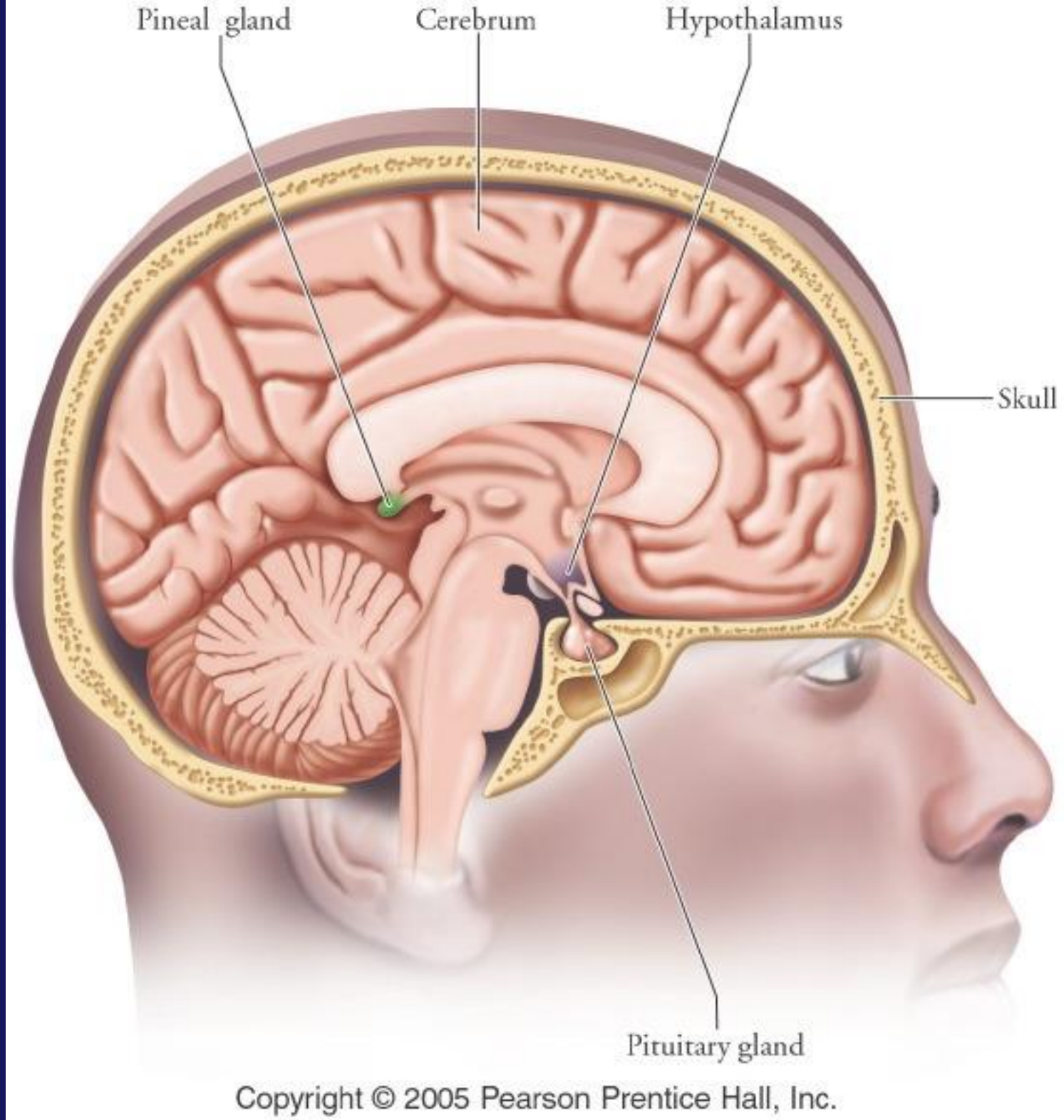
- Synthetic, orally active steroids that are both anabolic and androgenic.
- Taken by athletes in large (often massive) doses.
- Effects
  - Increase in muscle mass
  - Shrinkage of gonads (testes and ovaries)
  - Beard growth, larynx, balding
  - Behavioral effects

Anabolic Steroids

Ovaries

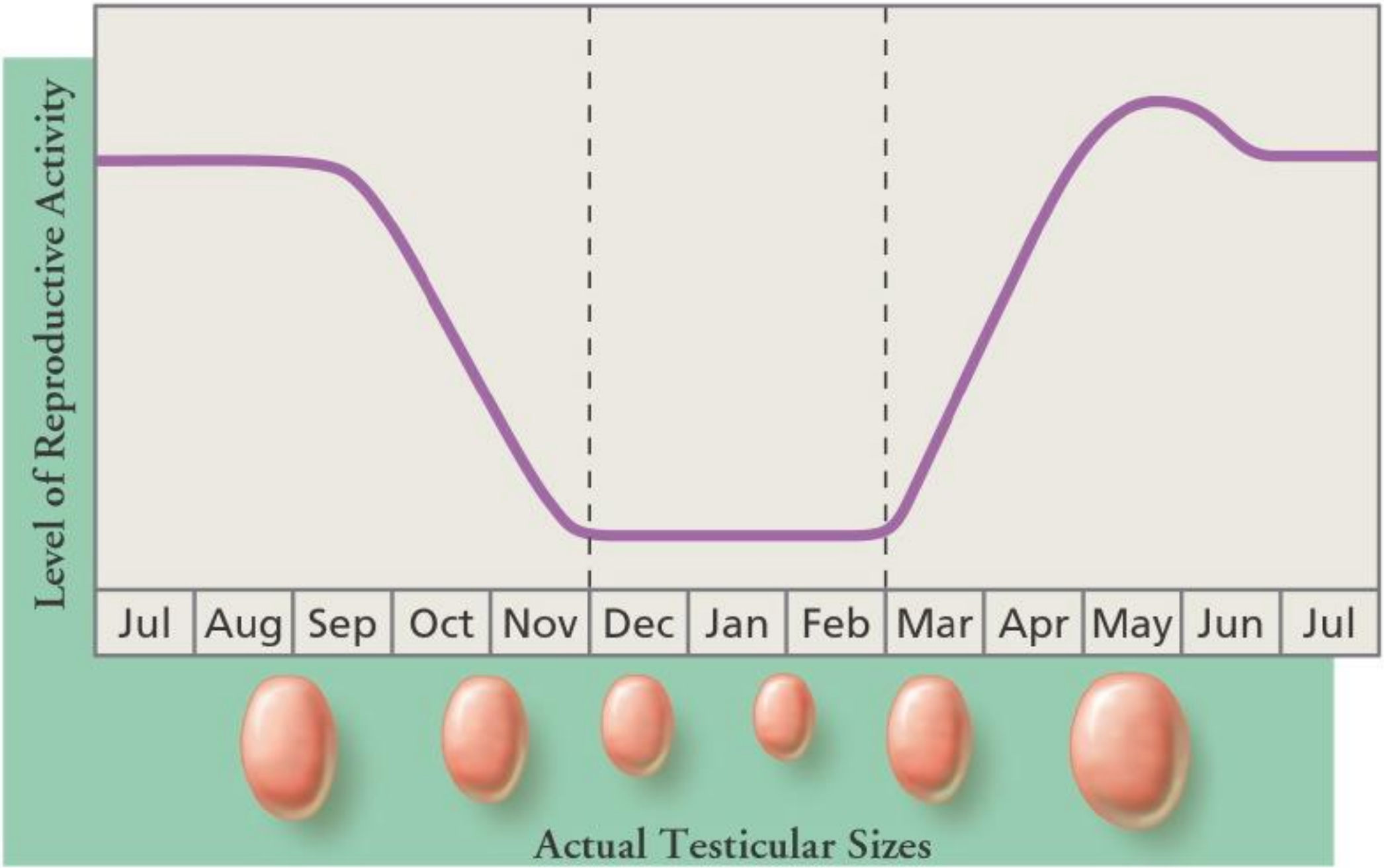
- Hormones (steroidal) and functions:
  - Estrogen:
    - initiates development of secondary sex characteristics
    - regulates menstrual cycle
  - Progesterone:
    - regulates menstrual cycle
    - maintains pregnancy

Pineal Gland



Pineal Gland

- The pineal gland secretes melatonin
- Melatonin secretion inhibited by light entering retina (lower in day than night)
- May regulate sleep and daily rhythms
- Melatonin regulates reproductive cycles in some vertebrates



(b) The reproductive cycle of the Syrian hamster