Influences on Plasma Concentration of Hormones

- The hormone rate of secretion
  - Negative feedback
  - Positive feedback
  - Rhythmic
    - Entrained to
      - Sleep/Wake
      - Age
      - Gender
      - Season
- The rate of Metabolic Activation or Conversion
- Transport
- Inactivation
- Excretion
Circadian Rhythm of ACTH and CORTISOL Release

Endocrine Dysfunction

- Can arise from a variety of factors
- Most commonly result from abnormal plasma concentrations of a hormone caused by inappropriate rates of secretion
  - Hypossecretion
    - Too little hormone is secreted
  - Hypersecretion
    - Too much hormone is secreted
**Hyposecretion**

- **Primary hyposecretion**
  - Too little hormone is secreted due to abnormality within gland
  - Causes
    - Genetic
    - Dietary
    - Chemical or toxic
    - Immunologic
    - Other disease processes such as cancer
    - Iatrogenic
    - Idiopathic

- **Secondary hyposecretion**
  - Gland is normal but too little hormone is secreted due to deficiency of its tropic hormone

**Hypersecretion**

- **Causes**
  - Tumors that ignore normal regulatory input and continuously secrete excess hormone
  - Immunologic factors

- **Primary hypersecretion**
  - Too much hormone is secreted due to abnormality within gland

- **Secondary hypersecretion**
  - Excessive stimulation from outside the gland causes oversecretion

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**Fig. 17-3a, p. 499**

- (a) Relation of pituitary gland to hypothalamus and rest of brain
- (b) Enlargement of pituitary gland and its connection to hypothalamus
Hypothalamic Releasing and Inhibiting Hormones

- Secretion of each anterior pituitary hormone is stimulated or inhibited by one or more hypothalamic hypophysiotropic hormones.
Neural input

Hormonal input

Hypothalamic neurosecretory neuron (secretes)

Hormone 1

(Special short portal system)

Anterior pituitary

Hormone 2

(Systemic circulation)

Target endocrine gland (secretes)

Hormone 3

(Systemic circulation)

Target cells

Physiologic effect

Metabolic changes that help resist stress

Most cells

Cortisol

Adrenal cortex

Adrenocorticotropic hormone (ACTH; corticotropin)

Negative feedback

Anterior pituitary (Special short portal system)

Corticotropin-releasing hormone

Hypothalamus

Stress

Fig. 17-6, p. 505

Systemic venous blood out

Anterior pituitary

Posterior pituitary

Hypothalamic-hypophyseal portal system

Releasing and inhibiting hormones

Endocrine cells of anterior pituitary (secrete anterior pituitary hormones into systemic blood)

Capillaries in anterior pituitary

Systemic arterial blood in

Hypothalamus

Releasing and inhibiting hormones

Negative feedback

Anterior pituitary (Special short portal system)

Corticotropin-releasing hormone

Hypothalamus

Stress

Fig. 17-7, p. 506

Adrenal Glands

- Cortisol
  - Stimulates hepatic gluconeogenesis
  - Inhibits glucose uptake and use by many tissues, but not the brain
  - Stimulates protein degradation in many tissues, especially muscle
  - Facilitates lipolysis
  - Plays key role in adaptation to stress
  - At pharmacological levels, can have anti-inflammatory and immunosuppressive effects
    - Long-term use can result in unwanted side effects
    - Displays a characteristic diurnal rhythm
    - Secretion
      - Regulated by negative-feedback loop involving hypothalamic CRH and pituitary ACTH
Metabolic fuels and building blocks available to help resist stress

Blood fatty acids (by stimulating lipolysis)

Blood amino acids (by stimulating protein degradation)

Blood glucose (by stimulating gluconeogenesis and inhibiting glucose uptake)

Cortisol

Adrenal cortex

Adrenocorticotropic hormone (ACTH)

Corticotropin-releasing hormone (CRH)

Anterior pituitary

Hypothalamus

Stress

Glucotonyx

Fig. 17-19, p. 320