PowerLecture:
Chapter 36
Endocrine Control
Section 36.0: Weblinks and InfoTrac

**See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)**

- Section 36.0: Environmental Hormones

- Section 36.0: *Our Stolen Future*

How Would You Vote?

The following is the question for this chapter. See national results below.

- Should atrazine use continue during further study of its effects?

Impacts, Issues: Hormones in the Balance

- Atrazine is an herbicide that was used for over 40 years in the United States

- Atrazine contamination is common in Midwest soil and water

- Tyrone Hayes' experiments on effects of Atrazine on animals showed that the herbicide significantly feminized exposed frogs

Impacts, Issues: Hormones in the Balance

- Other hormone-disrupting chemicals damage aquatic habitats, especially threatening amphibians

- 1939-1990: sperm counts of males in Western countries declined by about 40%

- Men in agricultural areas may have the lowest counts

- Estrogen-like chemicals may be the culprit

Section 36.1: Weblinks and InfoTrac

**See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)**

- Section 36.1: Endocrine Web

- Section 36.1: The Endocrine System. Susanne Hiller-Sturmhofel et al. *Al-cohol Health & Re-search World,* Summer 1998.

Other Signaling Molecules

- Neurotransmitters
- Local signaling molecules
- Pheromones

Endocrine System

Main Sources

- Pituitary gland
- Adrenal glands
- Thyroid gland
- Parathyroid glands
- Pineal gland
- Thymus gland

Section 36.2: Weblinks and InfoTrac

**See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)**

- Section 36.2: How Peptide Hormones Get Ready for Work. Jean Marx. *Science,* May 10, 1991.

Discovery of Hormones

- Bayliss and Starling severed nerves to dog's intestine; left blood vessels intact
- Pancreas still responded
- Extracts of glandular epithelium also provoked pancreatic response
- Extracts contained secretin

Hormones

- Secreted by endocrine glands, endocrine cells, and certain neurons
- Travel through the bloodstream to nonadjacent target cells

Hormone Action

- Activation of receptor
- Transduction of signal
- Functional response

Responses to Hormones Vary

- Different hormones activate different responses in the same target cell

- Not all types of cells respond to a particular hormone

Two Main Hormone Types

- Steroid hormones
  - Derived from cholesterol
  - Estrogens, progestins, androgens, cortisol, aldosterone

Steroid Hormones

Protein Hormone

- Hormone binds to a receptor at cell surface
- Binding triggers a change in activity of enzymes inside the cell

Section 36.3: Weblinks and InfoTrac

**See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)**

- Section 36.3: Hormone Control—The Hypothalamus
- Section 36.3: Considerations Related to the Use of Recombinant Human Growth Hormone in Children. *Pediatrics,* Jan. 1997.

The Hypothalamus

- Region in the forebrain
- Contains hormone-secreting cells
- Interacts with pituitary

Pituitary Gland

- Pea-sized gland at base of hypothalamus
- Two lobes
  - Posterior lobe stores and secretes hormones synthesized in the hypothalamus
  - Anterior lobe produces and secretes its own hormones

Posterior Lobe

- Antidiuretic hormone (ADH)
- Oxytocin (OCT)

Anterior Pituitary

- ACTH
- TSH
- FSH
- LH
- PRL
- STH

Normal Hormone Production

- Generally, the body produces only very small amounts of hormones
- To isolate 1 milligram of TRH, researchers dissected 7 metric tons of hypothalamic tissue

Abnormal Somatotropin Output

- Gigantism
- Pituitary dwarfism
- Acromegaly

Section 36.4: Weblinks and InfoTrac

**See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)**

- Section 36.4: American Thyroid Association

- Section 36.4: The Case of the Underactive Thyroid. Peg Jordan. *American Fitness,* Jan. 2001.

Feedback Mechanisms

- Negative feedback
  - Increase in hormone triggers activities that inhibit further secretion
- Positive feedback
  - Increase in hormone triggers activities that stimulate further secretion

Cortisol

- Cortisol secretion
  - Inhibits blood glucose uptake by muscle and other tissues
  - Causes breakdown of proteins to amino acids and conversion to glucose
  - Causes degradation of adipose tissue to fatty acids for use as energy source

Feedback Control of
Cortisol Secretion

- Hypothalamus senses rise in glucose and secretes less releasing hormone (CRH)
- Anterior pituitary responds by secreting less ACTH
- Adrenal cortex slows its secretion of cortisol

Localized Feedback in Adrenal Medulla

- Norepinephrine secreted by neurons accumulates in the synaptic gap
- Some molecules bind to receptors on the axon endings that secreted them
- Prevents further secretion of norepinephrine by that axon

Thyroid Gland Disorders

Calcium Regulation

- Parathyroid hormone (PTH) is the main regulator of calcium in the blood
- It is secreted when calcium levels drop
- PTH causes bone cells to digest bone tissue and release calcium
- PTH also stimulates calcium reabsorption by the kidneys and absorption by the gut

Local Signaling Molecules

- Prostaglandins
  - Produced and secreted in response to local changes
  - Sixteen types with a variety of effects
- Growth factors
  - Affect cell division rates in tissues

Section 36.5: Weblinks and InfoTrac

**See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)**

- Section 36.5: Amphibian Malformations

- Section 36.5: Tadpole Science Gets Its Legs. Susan Milius. *Science News,* Jan. 12, 2002.

Deformed Frogs

- Something in water triggers deformities
- Problem thyroid function?
- Tadpoles from "hotspots" developed normally when given extra thyroid hormones
- UV, parasites also play a role

Section 36.6: Weblinks and InfoTrac

**See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)**

- Section 36.6: Journal of the Pancreas

- Section 36.6: The Pancreas. Mary Gavaghan. *AORN Journal,* June 2002.

Control of Glucose Metabolism

Section 36.7: Weblinks and InfoTrac

**See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)**

- Section 36.7: American Diabetes Association

- Section 36.7: Hypoglycemia Homepage Holland

- Section 36.7: Insulin: The Amazing Discovery. Marcia Levine Mazur. *Diabetes Forecast,* Aug. 2004.

Diabetes Mellitus

Excess glucose accumulates

Diabetes

Section 36.8: Weblinks and InfoTrac

**See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)**

- Section 36.8: The Joy of Fear. Jim Thornton. *National Geographic Adventure,* June–July 2002.

Adrenal Cortex

- Secretes cortisol
- Negative feedback loops to hypothalamus and pituitary maintain proper cortisol levels
- Corisol maintains glucose levels in the absence of food by inducing liver cells to break down stored glycogen

Adrenal Medulla

- Inner region of adrenal gland
- Secretes epinephrine and norepinephrine, which are neurotransmitters or hormones, depending on context
- Responsible for fight-flight response to stress and excitement

Section 36.9: Weblinks and InfoTrac

**See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)**

- Section 36.9: Stress Management and Physiology
- Section 36.9: Humor: A Mind-Body Connection. A.J.S. Rayl. *The Scientist,* Oct. 2, 2000.

Stress

- Stress induces secretion of cortisol, epinephrine, and norepinephrine
- Prolonged and repeated stress, as in baboons in lower levels of troop hierarchy, has greater physiological effect

Stress

- Chronic stress can interfere with:
  - growth
  - immune system
  - sexual function
  - cardiovascular function
- In humans, Cushing's syndrome is caused by long-term elevated cortisol levels

Section 36.10: Weblinks and InfoTrac

**See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)**

- Section 36.10: Handbook of Andrology

- Section 36.10: You Have a Secret Sex Cycle. Anuradha Koli. *Cosmopolitan,* Sept. 2004.

Videos: CNN

Ask your Thomson Sales Representative for these volumes on CD or VHS

- A&P, 2003, Vol. 7, *Hormone Replacement Therapy (*2:49)

The Pineal Gland

- Photosensitive gland embedded in brain
- Absence of light; secretes melatonin
- Affects human biological clock
- May also play role in human puberty and seasonal affective disorder

Section 36.11: Weblinks and InfoTrac

**See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)**

- Section 36.11: Index of Entomology Resources

- Section 36.11: Chemical Insecticides for the 21st Century. Trevor Perrior. *Chemistry and Industry,* Nov. 1993.

Invertebrate Molting

- Periodic discarding and replacement of a hardened cuticle
- Under control of ecdysone
  - Steroid hormone
  - Secretion tied to environmental cues

Section 36.12: Weblinks and InfoTrac

**See the latest Weblinks and InfoTrac articles for this chapter online or click highlighted articles below (articles subject to change)**

- Section 36.12: Vertebrate Hor-mones

Hormone Coordination

- Our bodies are attuned to hormones, which are coordinated and directed by hypothalamus and pituitary gland

- Hormones bind to every tissue and are key players in development and maintenance of homeostasis