Endocrine Functions

- Maintains homeostasis by producing and releasing chemicals called hormones
- Controls long-term processes
  - examples:
    - Growth & development
    - Reproduction
    - Metabolism

Types of Glands

- Exocrine Glands
  - Formed from epithelial tissue.
  - Release their products at the body’s surface or into body cavities through ducts.
- Endocrine Glands
  - Formed from epithelial tissue.
  - Release their products - hormones - into the blood or lymph - ductless glands
What are Hormones?

- Chemical messengers secreted by endocrine glands.
- Responsible for specific regulatory effects on certain parts or organs.

Mechanisms of Hormone Action 1

- Hormones affect only certain target tissue cells or organs (specificity)
  - Note: blood-borne hormones circulate to all body organs
- Hormones interact with specific receptors in specific target cells
Mechanisms of Hormone Action 2

- **Receptor Responses:**
  - Stimulate synthesis of proteins or certain regulatory molecules in cell
  - Activate or inactivate enzymes
  - Stimulate mitosis
- **Increase or decrease the rate of normal cell function**
  - *NOT new function*

Control of Hormone Release

- **Negative feedback mechanism**
  1. Hormone secretion triggered by some stimulus.
  2. Rising hormone levels inhibit further hormone release.
  3. Hormones vary only within a very narrow range.
Endocrine Gland Stimuli

1. Hormonal stimulus
   - Endocrine gland prodded into action by other hormones
2. Humoral stimulus
   - Changing blood levels of certain ions and nutrients may stimulate hormone release
3. Neural stimulus
   - Nerve fibers stimulate hormone release

Major Endocrine Organs

- Hypothalamus
- Pituitary Gland
- Thyroid Gland
- Parathyroid Glands
- Adrenal Glands
- Pancreatic islets
- Pineal Gland
- Thymus
- Ovaries
- Testes
Posterior Pituitary Hormones

- Oxytocin
  - Acts on
    - mammary glands
    - uterus
- ADH - antidiuretic hormone
  - Acts on kidney tubules
Anterior & Posterior Pituitary Gland

Anterior Pituitary Hormones

- TSH - thyroid stimulating hormone
- FSH & LH - follicle stimulating hormone & luteinizing hormone
- ACTH - adrenocorticotropic hormone
- MSH - melanocyte stimulating hormone
- PRL - prolactin stimulating hormone
- GH - growth hormone
FSH and LH

- **Females**
  - FSH – stimulates follicle development
  - LH – triggers ovulation of egg

- **Males**
  - FSH – stimulates sperm development
  - LH – stimulates testosterone production

**Male Gonads**

- **Testes**
- Suspended in scrotal sac
- Produces:
  - Sperm
  - Androgens
    - testosterone
Female Gonads

- Ovaries
- Produces:
  - Eggs
  - Steroid hormones
    - estrogens
    - progesterone

Adrenal Medulla

- Stimulated by Sympathetic NS
  - “Fight or flight”

- Secretes two (2) hormones (catecholamines)
  - Epinephrine
  - Norepinephrine
Adrenal Cortex

- Secretes 3 different corticosteroids
  1. Mineralocorticoids
     - Increases salt & water levels in blood
     - aldosterone
  2. Glucocorticoids
     - Increases blood glucose levels
     - cortisol
  3. Androgens
     - males & females

Action of ACTH

ACTH stimulates the adrenal cortex.

Action of PRL

PRL promotes lactation.
**Slide 28**

![Image of a goat with text: Prolactin (plus several other hormones)]

**Slide 29**

**Action of MSH**

- melanocyte stimulating hormone (MSH)

- MSH stimulates melanocytes.

**Slide 30**

**Action of GH**

- growth hormone (GH)

- GH promotes bone and muscle growth.
Growth Hormone

- Youth - promotes bone and muscle growth
  - final body size
- Adulthood – promotes repair
- Hypersecretion
  - youth - gigantism
  - adult - acromegaly
- Hyposecretion

Gigantism

- Hypersecretion of growth hormone in youth
- excessive proportional growth

Acromegaly

- Hypersecretion of growth hormone in adults
- Disproportional enlargement of
  - jaw
  - hands
  - tongue
GROWTH HORMONE TREATMENT OF TIBIAL FRACTURES: A RANDOMISED, DOUBLE-BLIND, PLACEBO-CONTROLLED TRIAL

Adverse events
- consistent with those usually seen in tibial fractures (infections) or during hGH treatment in adults (peripheral edema, arthralgia).

CONCLUSION:
- In closed tibial fractures separately, hGH treatment accelerated healing
- significantly, which may be of benefit in people with closed fractures.
- No new hGH safety issues were identified.

Aging Baby Boomers turn to hormone

Some doctors concerned about growing 'off-label' use of drug

Pancreas

- location
- mixed gland
  - endocrine
    - insulin & glucagon
  - exocrine
    - digestive enzymes
- pancreatic islets
  - beta cells
  - alpha cells
Thyroid Gland

- Location
- Most cells of body have receptors for thyroid H
- Produces:
  - thyroid hormone
    - increases rate of O2 use
    - Basal metabolic rate (BMR)
    - increases use of glucose
    - for ATP production
  - Calcitonin
    - calcium homeostasis
    - increases osteoblast activity
Parathyroid Gland

- **Location & Number**
- **Produces parathyroid hormone**
  - calcium homeostasis
    - increases blood calcium levels
    - increases osteoclast activity

Pineal Body

- **Location:** in epithalamus of diencephalon
- **Functions:** (some uncertainty)
  - biological clock
  - inhibits sexual maturation in childhood
    - inhibits secretion of FSH & LH
Thymus Gland

- **Location:** posterior to sternum
- **Size relative to age**
- **Functions:**
  - promotes immune system development and function
  - T-lymphocytes maturation

Effects of Anabolic Steroids

- balding in men and women
- hair on face and chest in women
- deepening of voice in women
-roid mania—delusions and hallucinations; depression upon withdrawal
- severe acne
- breast enlargement in men and breast reduction in women
- kidney disease and retention of fluids, called “steroid diet”
- reduced testicular size, low sperm count, and impotency
- high blood cholesterol and atherosclerosis; high blood pressure and damage to heart
- liver dysfunction and cancer
- in women, increased size of ovaries; cessation of ovulation and menstruation
- stunted growth in youngsters by prematurely halting lengthening of bones
Body Growth

The following hormones stimulate body growth and development of nervous tissue:

- Growth hormone
- Insulin
- Thyroid hormones

Aging and Endocrine Function

Pituitary gland
- decrease GH → muscle atrophy

Thyroid gland
- decrease thyroxin → decrease metabolism
  → increase fat deposition

Pancreas
- decrease insulin → poorer control of glucose levels

The End