What is the function of the endocrine system?

Integration of Body Functions

- nervous and endocrine systems are similar
- nervous system
  - seconds
- endocrine system
  - minutes and hours

Neuro-endocrine Response

Manipulation of the Endocrine System

- Hormones can be used to regulate body functions
  - growth (anabolic steroids)
  - lactation (GH or STH)
  - birth control (Estradiol, Progesterone)
  - estrous cycle (PGF$_{2a}$)
  - superovulation and embryo transplant (FSH,eCG)
  - parturition (oxytocin)

Endocrine Gland

- A ductless gland
- Secretes substances (hormones) into blood or lymph that affect cells elsewhere in the body
- The secretion does not involve loss of tissue
Exocrine Gland
A gland with ducts that are used for secretion

Hormone
• Substance produced by endocrine gland
• Acts on cells, tissues or organs at a place other than where produced
  • Acts as a catalyst.

Endocrine Glands

Classification and Properties of Hormone
A. Site of Production
B. Type of action
  1. Primary hormone of reproduction
  2. Metabolic hormone
C. Chemical Structure
  1. General structure
     • Proteins and polypeptides
     • Steroids
     • Fatty acids
     • Modified amino acid
  2. Size

Location of the Hypothalamus and Pituitary Gland
Hypothalamus

Function of Hypothalamus

• appetite
• thirst
• body temperature
• vasomotor activity
• emotion
• use of body nutrient reserves
• activity of intestine
• sleep
• sexual behavior
• Production and release of releasing hormones

Releasing Hormones of the Hypothalamus

A. Structure
• short chain polypeptides (3 - 44 amino acids)

B. General Function
• to cause the release of trophic hormones from the anterior pituitary gland

Releasing Hormones of the Hypothalamus

C. Hormones
• Gonadotropin releasing hormone (GnRH)
  → LH, FSH release
• Thyrotrophin releasing hormone (TRH)
  → TSH and prolactin release
• Corticotrophin releasing hormone (CRH)
  → ACTH release
• Growth hormone releasing hormone (GH-RH)
• Somatostatin (growth hormone inhibiting hormone)
Hypothalamus and Anterior Pituitary Gland

Anterior Pituitary Hormones

A. Structure
1. glycoproteins or proteins

B. Hormones
1. gonadotropins
   - Follicle stimulating hormone (FSH)
   - Luteinizing hormone (LH)
   - Prolactin

2. Other trophic hormones
   - Adrenal Corticotropin (ACTH)
   - Thyroid stimulating hormone (TSH)
   - growth hormone (GH or STH)

Posterior Pituitary Hormones

A. Structure
   - polypeptides (9 amino acids)

B. Hormone
   - Oxytocin - contraction of smooth muscle
**Placental Hormones**

- **Equine Chorionic Gonadotropin (eCG)**
  - Formation of accessory CL and maintains pregnancy
- **Human Chorionic Gonadotropin (HCG)**
  - Maintains primate CL and pregnancy
- **Placental Lactogen (PL)**
  - Development of the mammary gland in the mother
- **Steroids - Estrogen and Progesterone**

**Gonadal Polypeptide Hormones**

- **Relaxin**
  - Secreted by CL during pregnancy.
  - Parturition
- **Inhibin**
  - Inhibits FSH release

**Gonadal Steroids**

A. General

- Origin - ovary, testis, adrenal
- Structure

B. Type of Steroids

- **Androgens - Testosterone**
- **Estrogen - Estradiol**
- **Progestin - Progesterone**
Other Hormones

A. Prostaglandins
1. PGF\(_{2\alpha}\)
2. PGE\(_{2\alpha}\)

Other Hormones

B. Melatonin
1. Secreted from the pineal gland.
2. Is a modified amino acid
3. Functions to integrate effects of light on reproductive processes.

Other Hormones

C. Human Menopausal Gonadotropin (hMG)
1. Anterior pituitary gland
   - Secreted in menopause, FSH-like activity
   - Isolated from urine
   a. Pergonal - superovulation
A. Site of Production

B. Type of action

1. Primary hormone of reproduction
   (FSH, LH, estradiol, progesterone)

2. Metabolic hormone
   (thyroxin, insulin, STH)

Chemical Structure of Hormones

- **Polypeptides** - hypothalamic
- **Protein** - pituitary, gonad
- **Steroids** - gonad, adrenal
- **Fatty acid** - many sources, prostaglandins
- **Modified amino acid** - pineal

Chemical Structure of Hormones Cont.

- Peptide bond
- These hormones can *not* be given orally!

Chemical Structure of Hormones Cont.

Streoid Biosynthesis

- Cholesterol
- Adrenal
- Pregnenolone
- Ovary or Testis
- Progesterone
- Cortisol
- Testosterone
- Estradiol

These hormones can be given orally!!!