Endocrine Glands and Hormones

What is the difference between the Nervous and Endocrine system?

Nervous System
- Fast and fleeting
- Specifically acts on one or a few cells
- Electricity based

Endocrine System
- Slow and sustained
- Can act on many cells and many cell types
- Chemically based

What are sources of hormones?
- Hypothalamic: Produced by neurons in the hypothalamus
- Pituitary: released into circulation from anterior and posterior pituitary
- Gonadal: originate from gonads
- Placenta: Endocrine organ that produces steroids and relaxin

What components build a hormone?
- Proteins and Polypeptides
- Steroids
- Fatty acids
- Modified amino acids

What is a peptide and what are the peptide hormones?
- Few to several amino acids
- Oxytocin from anterior pituitary & GnRH from hypothalamus

What is a protein and what is the protein hormone?
- Long chains of amino acids
- Prolactin from anterior pituitary

What is a glycoprotein and what are the glycoprotein hormones?
- Protein hormone with carbohydrate molecule
- FSH, LH, eCG, & hCG

What are the steroid hormones and can they be administered orally?
- Progesterone, Testosterone, Estrogen, & Glucocorticoids
- Yes, these can be administered orally

What is the precursor to steroid hormones?

Cholesterol

Polypeptide and protein hormones are made out of what bonds? How can they NOT be administered?

Peptide bonds, can't be administered orally

Where is the receptor located for protein and peptide hormones?

Plasma membrane

* What are the key enzymes involved with synthesis of steroid hormones?

- CYP11A1 (convert cholesterol → pregnenolone)
- CYP17 (convert progestins → androgens)
- CYP19A1 (convert androgens → estrogens)

True/False: Steroid hormones can be given orally

True: They won't be broken down by digestive system

Where is the receptor located for steroid hormones?

Nucleus and plasma membrane

Where is the receptor located for prostaglandin hormones?

Plasma membrane

Where is melatonin produced from?

Pineal gland

What is the difference between Antagonist and Agonist?

- Antagonist DOES NOT initiate a biological response when bonded to its receptor
- Agonist DOES initiate a biological response when bonded to its receptor

What does the strength of hormone action depend on?

- Pattern and Duration of Secretion
- Half-Life
- Receptor Density
- Hormone Affinity

How do peptide & protein hormones stimulate a cellular effect? (NEED 2nd MESSENGER)

1. Hormone-Receptor Binding
2. Adenylate Cyclase Activation
3. Protein Kinase Activation
4. Synthesis of New Products

*Protein based hormones can't cross the phospholipid bilayer (lipophobic), need receptor on cell membrane

What are the steps needed for steroid hormones to stimulate cellular effect? (SLOW & FAST)

SLOW:

1. Steroid passes through cell membrane and cytoplasm
2. Binds to nuclear receptor
3. mRNA & protein synthesis

FAST:

1. Steroid binds to membrane receptor
2. Adenylate cyclase activation
3. Protein kinase activation
4. Changes in Ca2+ permeability

*Steroid hormones = NOT water soluble (NEED CARRIER PROTEIN, Ex: Albumin)

*Steroid hormones function by altering gene transcription and protein translation

How are hormones metabolized in the body?

- Protein Hormones: degraded by kidney and liver by breaking peptide bonds
- Steroid Hormones: Liver renders hormone H2O soluble, re-enters blood and enters kidney or bile, and then excreted in urine or feces