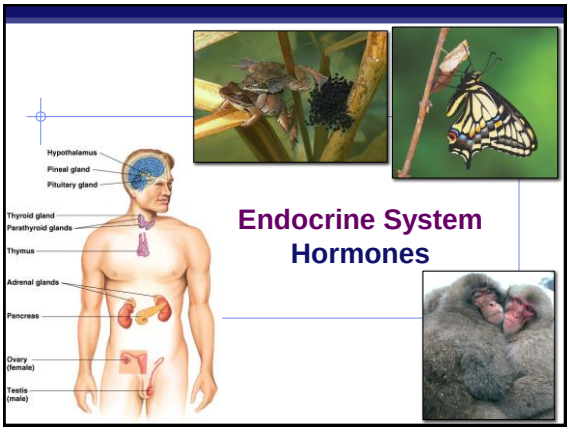
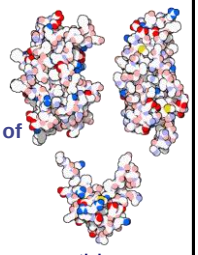


Endocrine System Hormones

Regulation

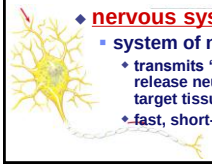
- Why are hormones needed?
  - chemical messages from one body part to another
  - communication needed to coordinate whole body
  - daily homeostasis & regulation of large scale changes
    - solute levels in blood
      - glucose, Ca^{++}, salts, etc.
    - metabolism
    - growth
    - development
    - maturation
    - reproduction

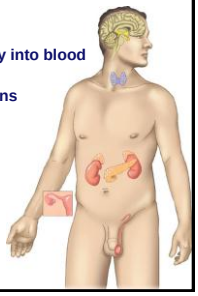


growth hormones

Regulation & Communication

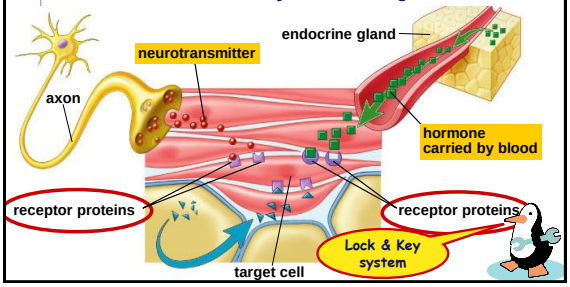
- Animals rely on 2 systems for regulation
  - endocrine system
    - system of ductless glands
      - secrete chemical signals directly into blood
      - chemical travels to target tissue
      - target cells have receptor proteins
      - slow, long-lasting response
  - nervous system
    - system of neurons
      - transmits "electrical" signal & release neurotransmitters to target tissue
      - fast, short-lasting response



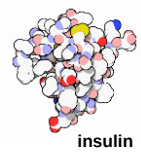


Regulation by chemical messengers

- Neurotransmitters released by neurons
- Hormones release by endocrine glands



Classes of Hormones



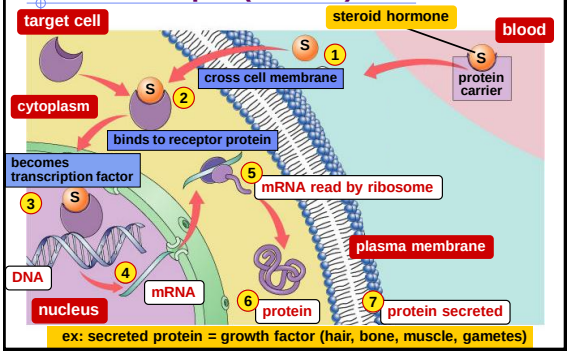
insulin

- Protein-based hormones
  - polypeptides
    - small proteins: insulin, ADH
  - glycoproteins
    - large proteins + carbohydrate: FSH, LH
  - amines
    - modified amino acids: epinephrine, melatonin
- Lipid-based hormones
  - steroids
    - modified cholesterol: sex hormones, aldosterone

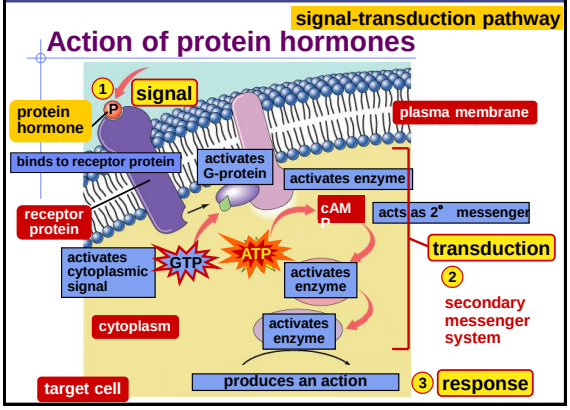
How do hormones act on target cells

- Lipid-based hormones
  - hydrophobic & lipid-soluble
    - diffuse across cell membrane & enter cells
    - bind to receptor proteins in cytoplasm & nucleus
    - bind to DNA as transcription factors
      - turn on genes
- Protein-based hormones
  - hydrophilic & not lipid soluble
    - can't diffuse across cell membrane
    - bind to receptor proteins in cell membrane
    - trigger secondary messenger pathway
    - activate internal cellular response
      - enzyme action, uptake or secretion of molecules…

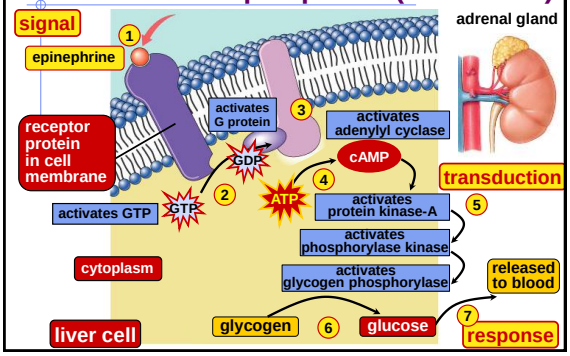
Action of lipid (steroid) hormones



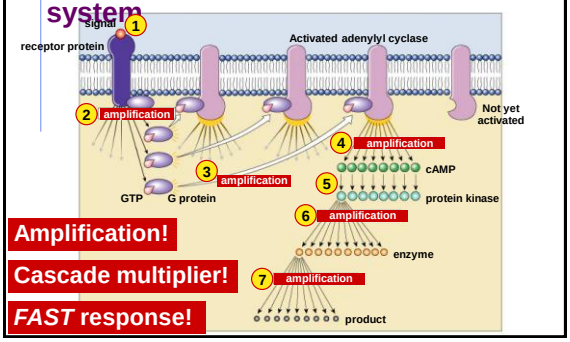
Action of protein hormones



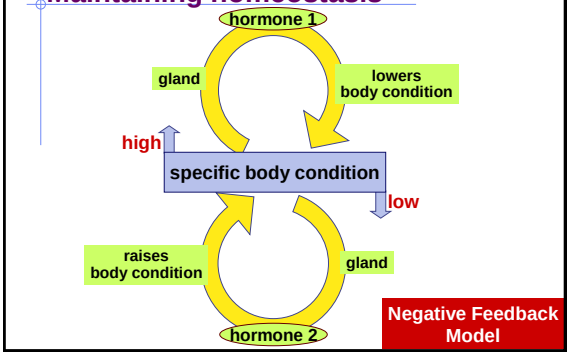
Ex: Action of epinephrine (adrenaline)



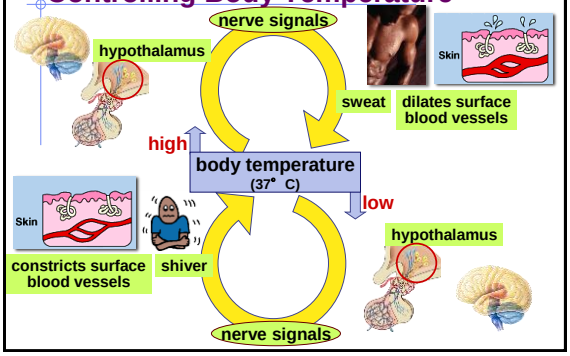
Benefits of a 2° messenger system



Maintaining homeostasis

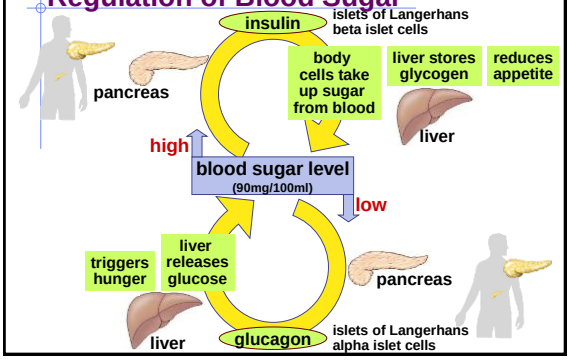


Nervous System Control Controlling Body Temperature



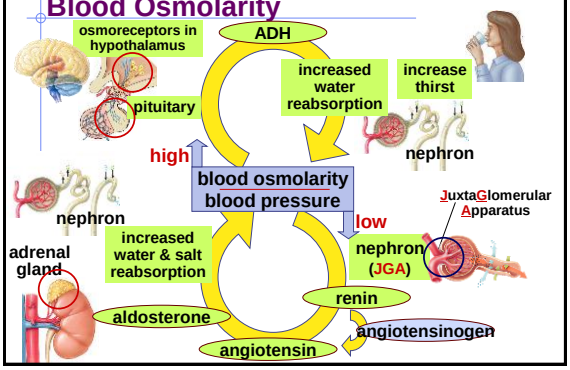
Endocrine System Control — Regulation of Blood Sugar

Feedback



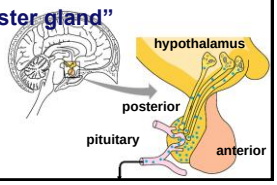
Endocrine System Control — Blood Osmolarity

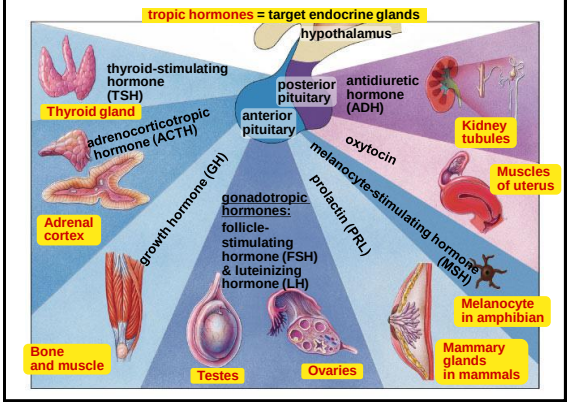
Feedback



Nervous & Endocrine systems linked

- Hypothalamus = "master nerve control center"
  - nervous system
  - receives information from nerves around body about internal conditions
  - releasing hormones: regulates release of hormones from pituitary
- Pituitary gland = "master gland"
  - endocrine system
  - secretes broad range of "tropic" hormones regulating other glands in body

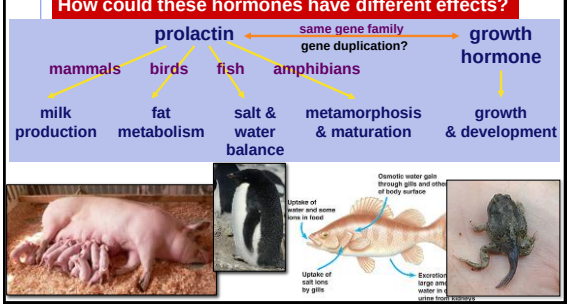




Homology in hormones

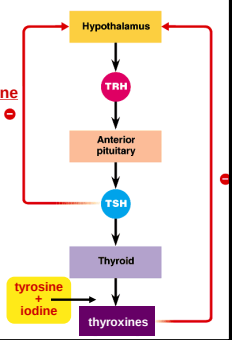
What does this tell you about these hormones?

How could these hormones have different effects?



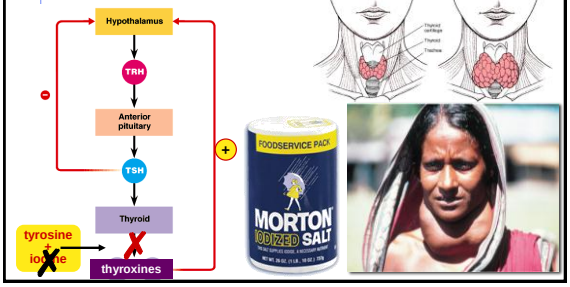
Regulating metabolism

- Hypothalamus
  - TRH = TSH-releasing hormone
- Anterior Pituitary
  - TSH = thyroid stimulating hormone
- Thyroid
  - produces thyroxine hormones
  - metabolism & development
    - bone growth
    - mental development
    - metabolic use of energy
    - blood pressure & heart rate
    - muscle tone
    - digestion
    - reproduction



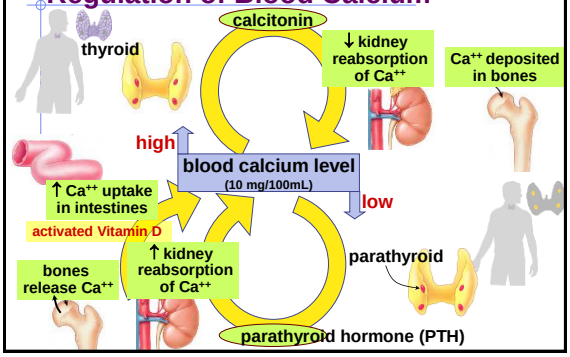
Goiter

Iodine deficiency causes thyroid to enlarge as it tries to produce thyroxine



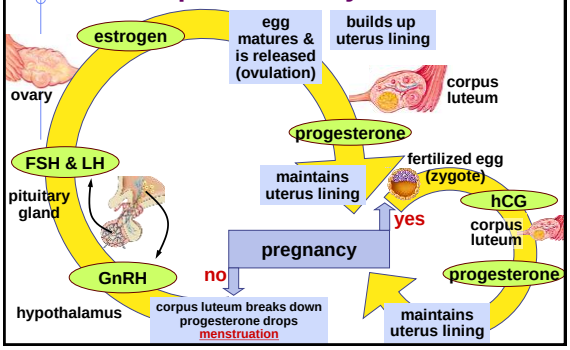
Endocrine System Control
Regulation of Blood Calcium

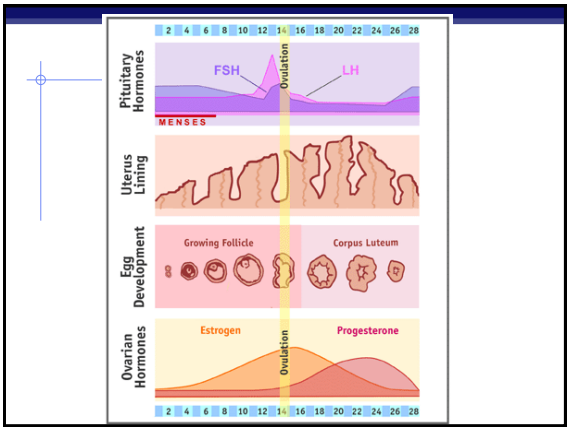
Feedback

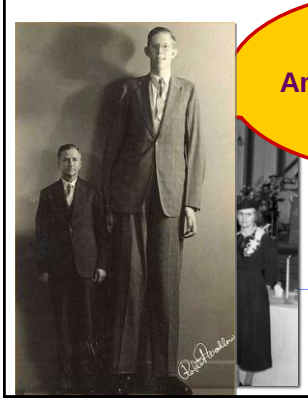


Female reproductive cycle

Feedback







Any Questions??

Robert Wadlow
1918-1940
8' 11"

2009-2010

Effects of stress on a body