

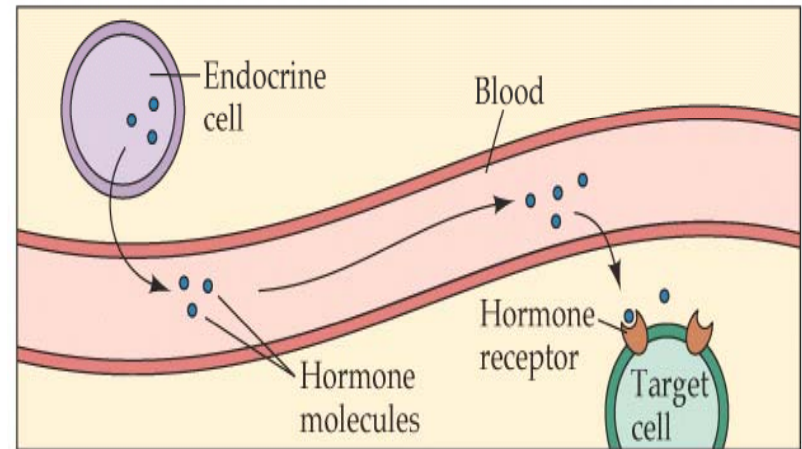
Hormones and the Brain (Ch 5)

- Review of hormones
 - Classes of hormones
- How do hormones work?
 - Cellular actions of steroid hormones
- Regulation of hormone levels
 - Hypothalamus and anterior pituitary
- FOR NEXT DAY: Start reading Chapter 12, focusing on pgs 365-381 (Sexual Differentiation)

What is a hormone?

- Chemicals secreted into the **BLOODSTREAM** by one set of cells and carried to other parts of the body to act on specific target tissues, produce specific physiological effects
- Many, but not all are secreted by **ENDOCRINE GLANDS**
- All hormones, like neuro-transmitters, exert their effects on target cells by interacting with **receptors**
 - Some hormone receptors are on the surface of cells (like neurotransmitter receptors) while others reside inside the cells

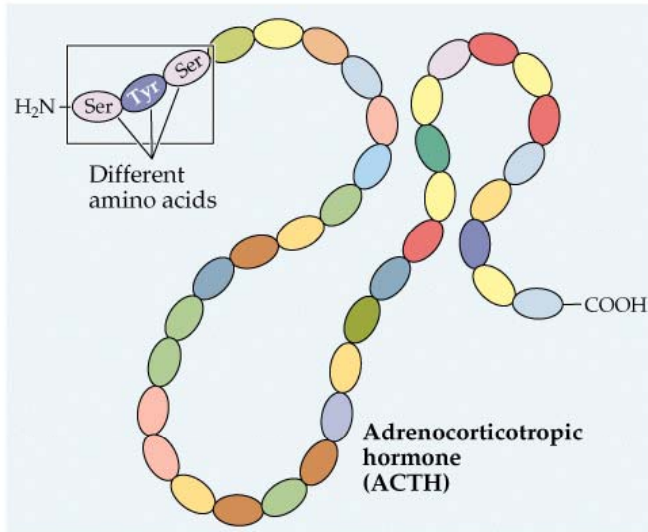
(d) Endocrine function



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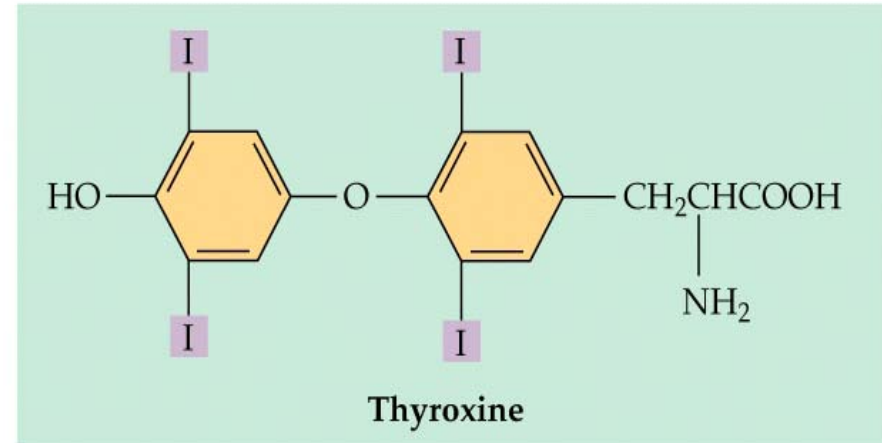
Three Main Hormone Types

(a) Protein hormone



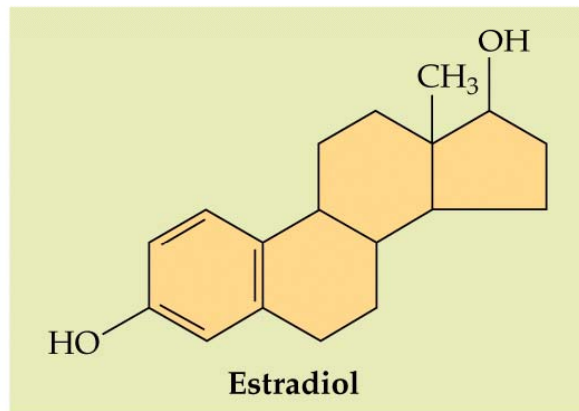
Peptide hormone: amino acid chain
-Big, cannot enter cells easily,
-Hits receptors on outside of cell

(b) Amine hormone



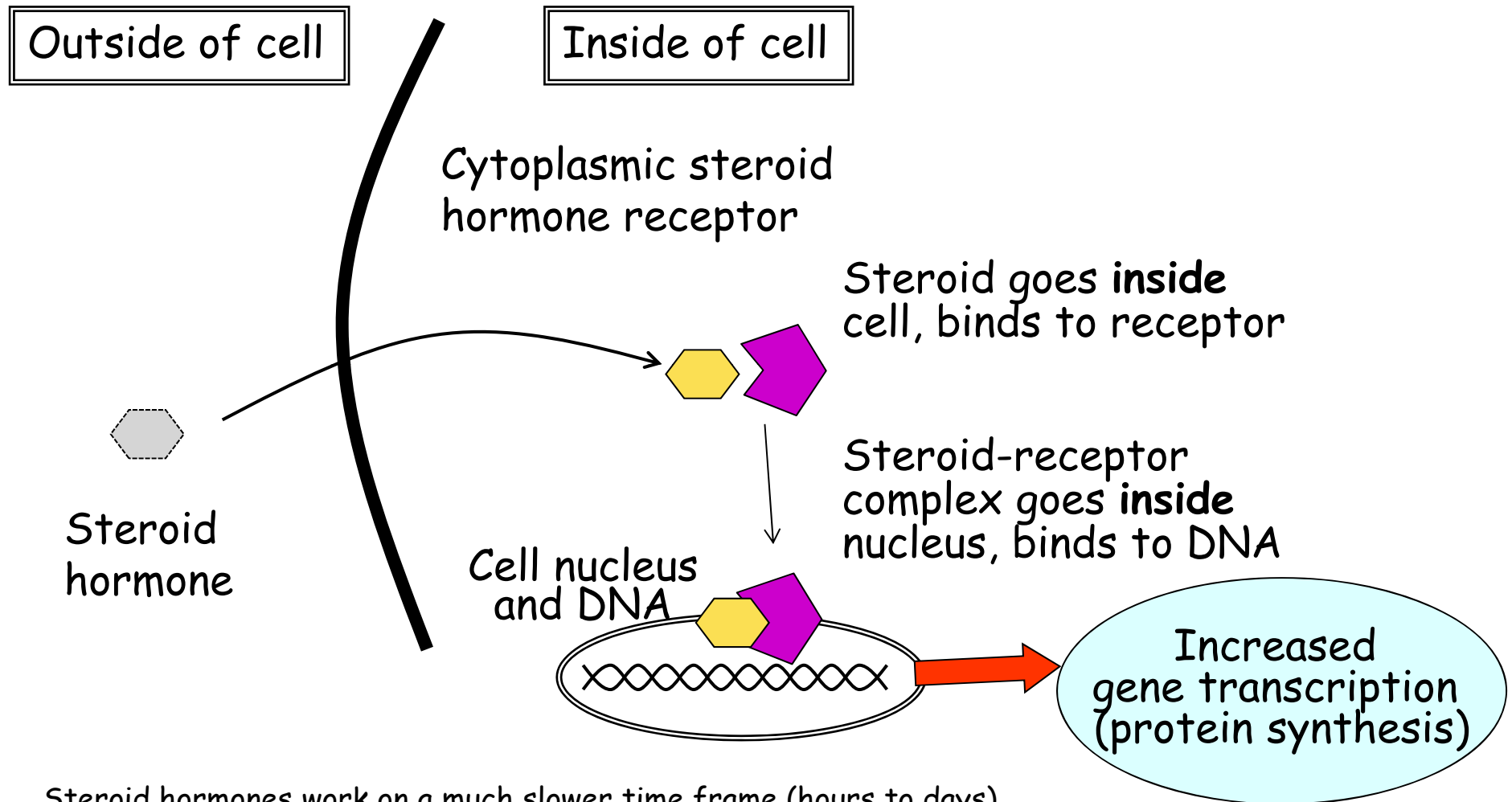
Amine hormone: modified amino acid;
-Small, but usually polar molecules
-Cannot enter cells easily,
-Hits receptors on outside of cell

(c) Steroid hormone



Steroid hormone: multiple carbon rings:
derived from cholesterol
-LIPID SOLUBLE
-Readily enters cells
-Hits receptors both on outside **and the inside** of cells

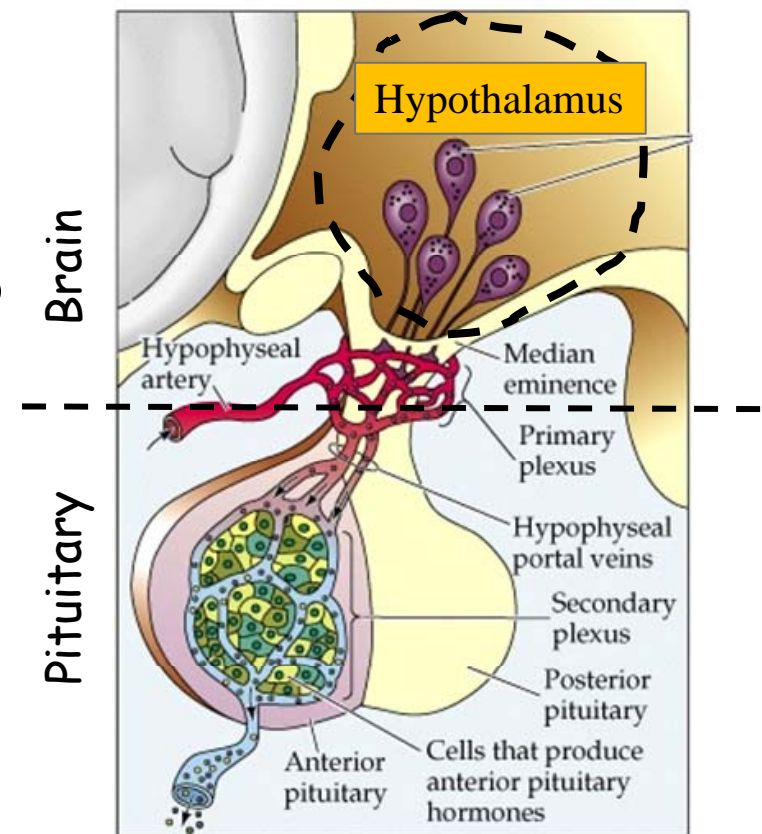
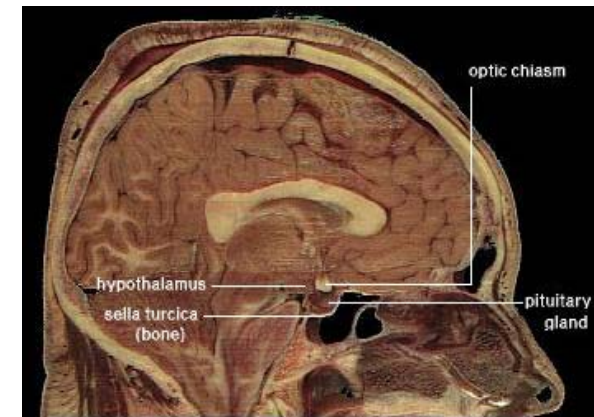
Steroid hormone action



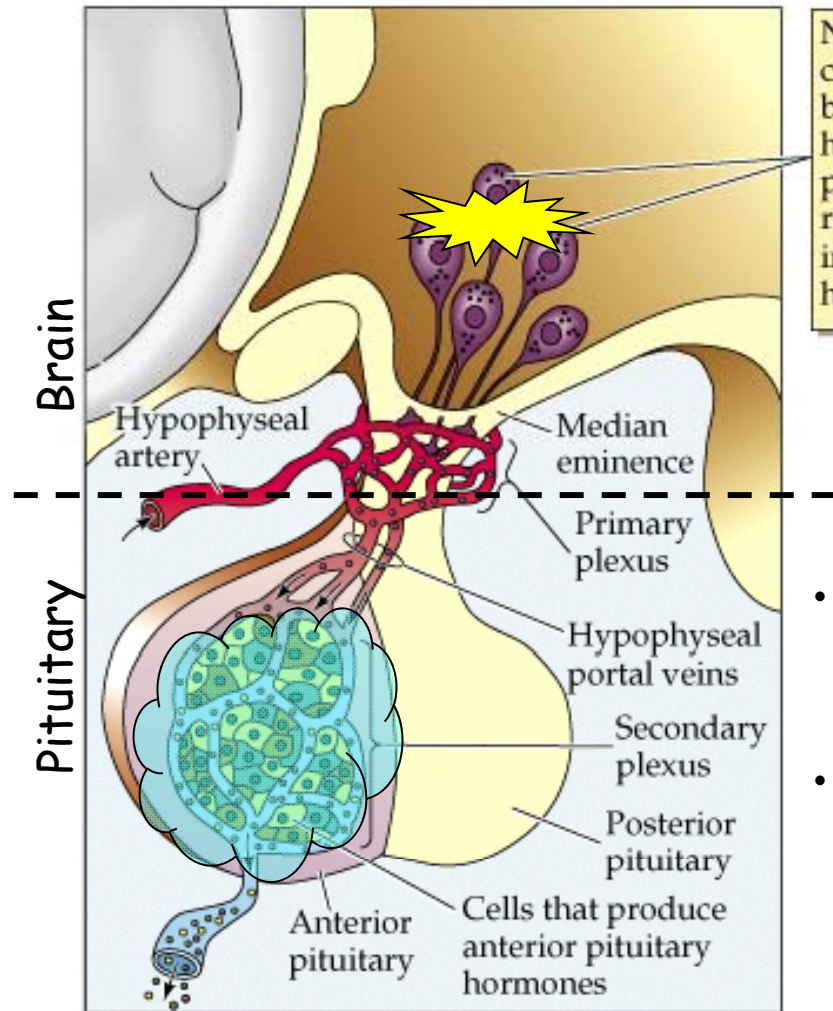
- Steroid hormones work on a much slower time frame (hours to days)
- Their effects are long lasting
- Some steroid hormones require a **steroid receptor co-factor**, which can alter its effect
- Some steroid hormones may also work like peptide/amine hormones by acting on **membrane bound receptors** in brain

Neural regulation of hormones

- The hypothalamus: Main brain structure involved in regulating hormonal levels in the body
- Located near the bottom of the brain (below thalamus); blood brain barrier in this area is weaker than rest of the brain
- Can be subdivided into many subregions, each involved in different functions
- The pituitary glands: located directly below the hypothalamus, consisting of two distinct parts
 - Anterior & Posterior pituitary
- These glands are not part of the brain, but receive direct input from the hypothalamus



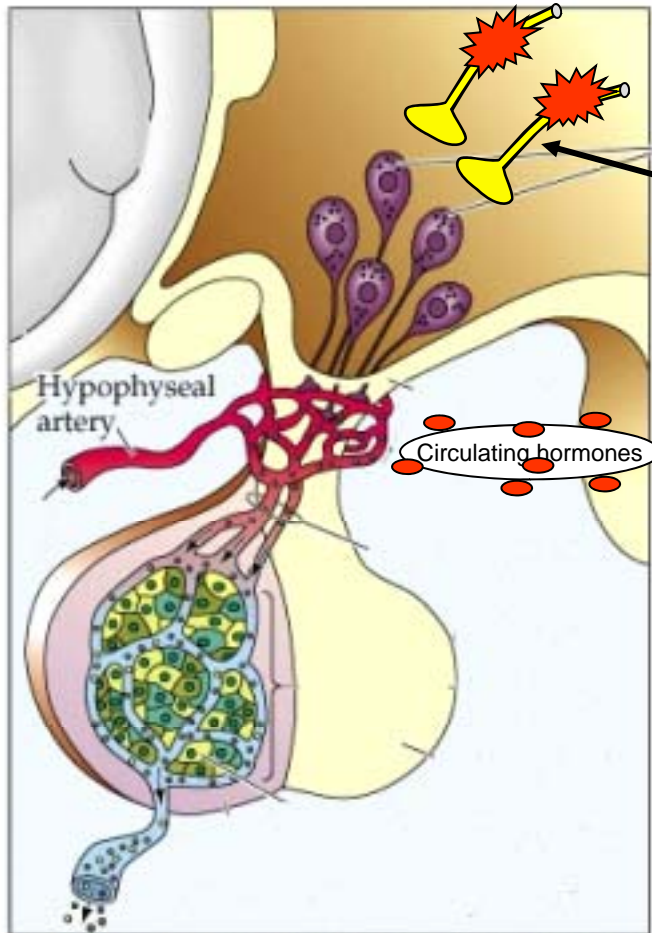
Hypothalamus-Anterior Pituitary



Neuroendocrine cell bodies in the hypothalamus produce releasing and inhibiting hormones ...

- Neuroendocrine cells from hypothalamus synapse on to blood vessels which make up the **hypothalamic-pituitary portal system**
- These neuroendocrine cells release hormones that in turn activate **OTHER** endocrine cells in the anterior pituitary
- Hormones released by hypothalamus can either **facilitate or inhibit** release of hormones by anterior pituitary

Neuroendocrine cells of hypothalamus



- Two ways to activate/inhibit neuroendocrine cells:
 - 1) Direct neural input from other brain regions (excitatory or inhibitory)
 - 2) Circulating hormones in the body
 - Blood brain barrier much weaker there
 - Hormones in blood that may not normally effect rest of brain can hit neuroendocrine cells