

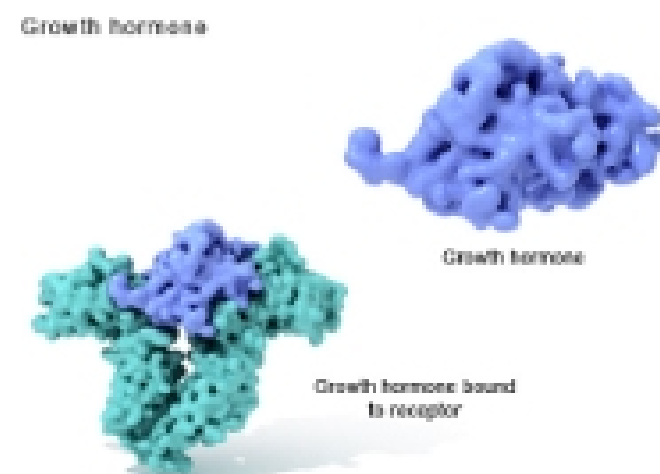
Chemical signals in animals

Keywords Reading Ch. 45

- Endocrine system
- Hormone
- Target cell
- Steroid
- Amino acid derived hormone
- Surface receptors
- Internal receptors
- Action of steroids
- Glucose homeostasis
- Insulin
- Glucagon
- Epinephrine
- Norepinephrine
- ACTH

Chemical signals

- Inside and outside an organism
- What is a chemical signal? Generally involves highly specific receptor/signal binding



http://www.youtube.com/watch?v=Ms_ehUVvKkk

Pheromone – signal outside of organisms

- A small often volatile chemical signal that functions in communication between animals
- Periplanone – emitted by female American cockroaches
- Human pheromones? Vomeronasal organ
- <http://www.youtube.com/watch?v=NhTTLNkbUw>

Will focus on chemical signals inside organisms

- Endocrine system
- Nervous system (later lectures)

Hormone

- Chemical signal secreted into body fluids (usually blood)
- Effective in minute amounts
- Plasma testosterone
 - 1.3 to 2.3 nanomoles per liter
- Plasma glucose
 - 5 millimoles per liter
- 2 to 4 million glucose molecules for every one testosterone

How dilute is 1.3 nmoles per liter?

- Ratio of water molecules to testosterone molecules is 43 billion to one
- What is 43 billion?
- There are 43 billion square feet in a square 40 miles x 40 miles

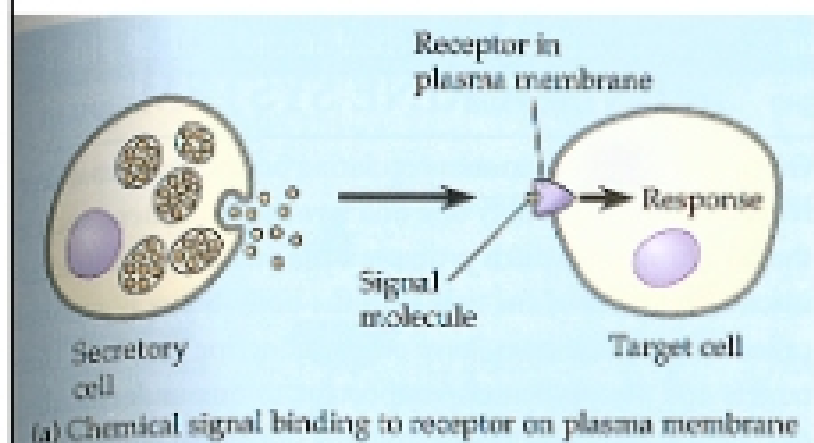
Many types of molecules are used as hormones

- Amino acid derived
 - Single amino acids
 - Peptides
 - Proteins
 - Glycoproteins
- Steroid (lipid soluble)
 - Made from cholesterol
 - Include sex hormones

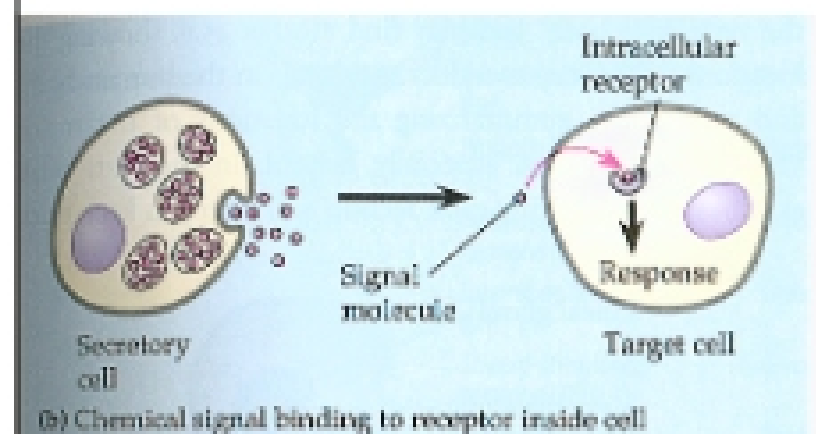
Hormones act on specific target cells in two ways

- Surface receptors
- Within target cells (internal receptor)

Surface receptor



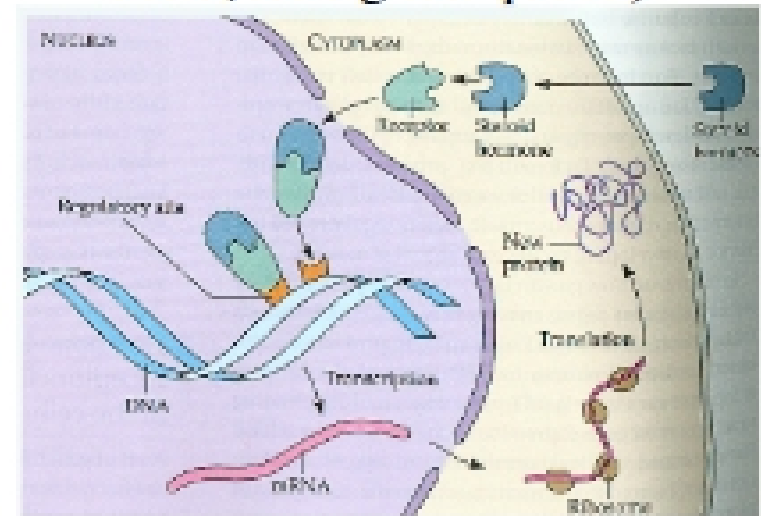
Internal receptor



Action of steroids

- Binding of steroid to internal receptor
- formation of complex that binds to DNA
- Binding regulates gene expression
- increases or decreases gene product

Action of steroids (diagram not in notes; see fig 45.5 p. 898)



Two examples of hormone action

- Glucose homeostasis
- Stress and the adrenal gland

Glucose homeostasis

- Homeostasis = The steady-state physiological condition of the body
- Glucose = major fuel of cellular respiration
- Normal blood glucose level = 5 millimoles per liter
- How is this regulated?
- First look at when glucose levels are too high

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