

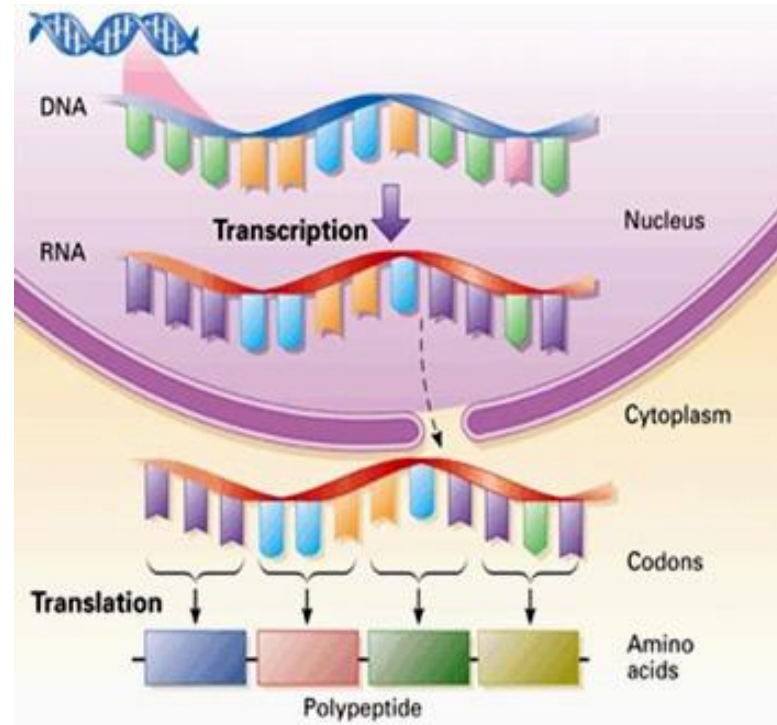
# Cell to Cell Communication via Steroids & Hormones

Packet #6

# Hormones & Gene Transcription

# Hormones & Gene Transcription

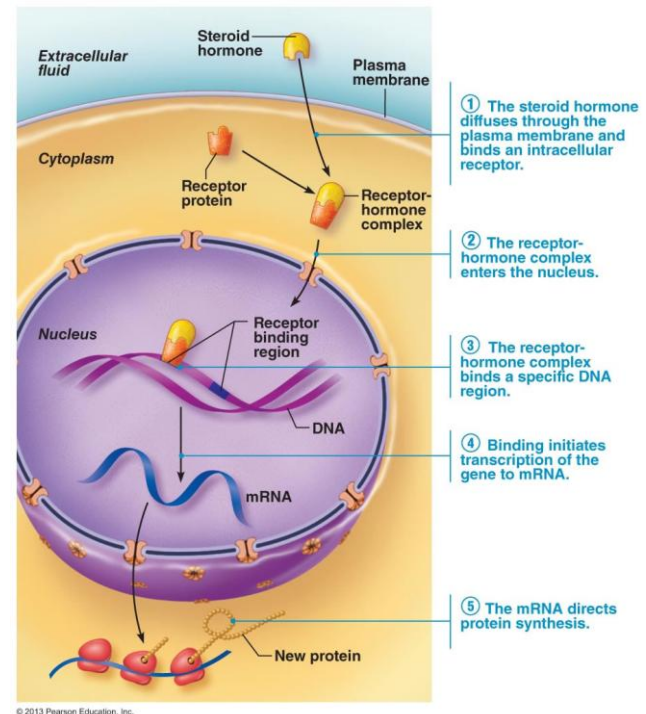
- ◆ Hormones are sometimes used to initiate **transcription and translation as a response.**
- ◆ Some hormones are small enough, and hydrophobic, to make it through the cell membrane where an **intracellular receptor will be used.**



# Steroid Hormones & Intracellular Processing

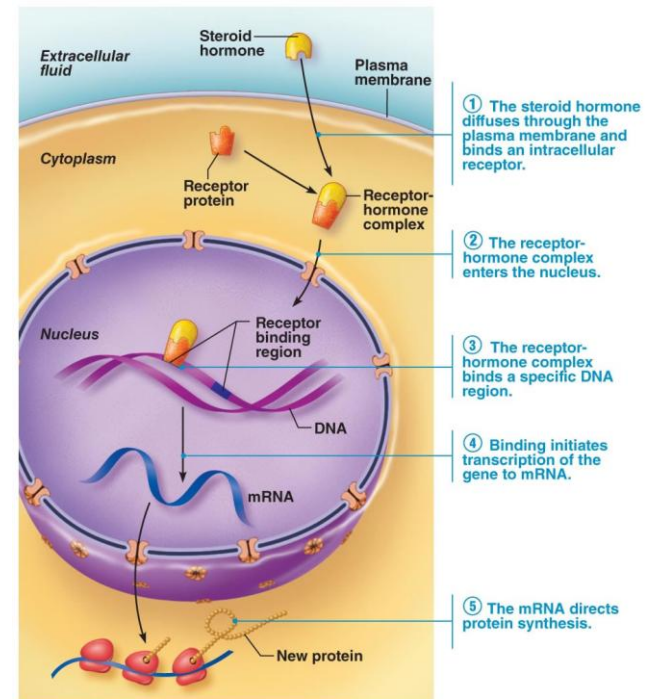
# Intracellular Signaling Process I

- ◆ Signal crosses membrane
- ◆ Binds to receptor protein
  - ◆ Forms receptor-agonist complex
- ◆ Complex is transported into the nucleus through the nuclear pores
- ◆ Complex activates the receptor protein
- ◆ Activated receptor protein binds at specific regulatory sequences on the DNA strand



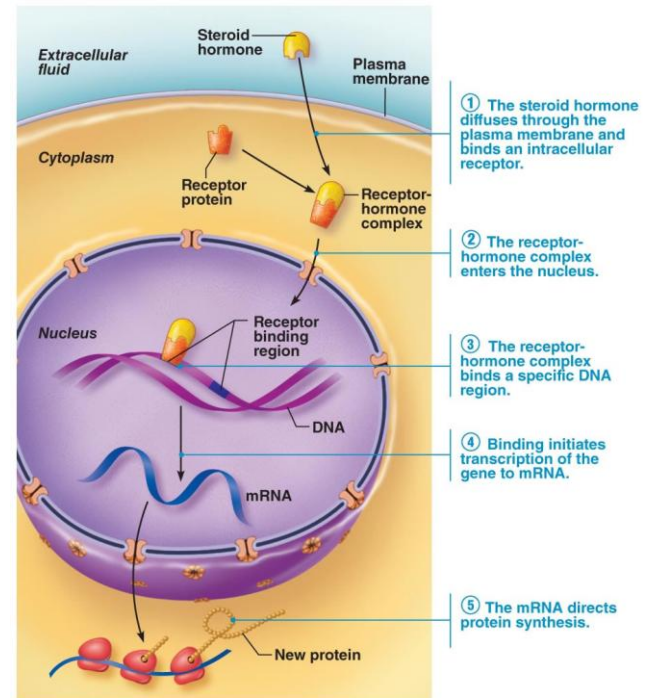
# Intracellular Signaling Process II

- \* Complex binds to specific region of DNA causing increased expression of specific genes
- \* Transcription is initiated.



# Intracellular Signaling Process III

- \* Keep in mind that the “response” is not immediate.
- \* Time is required to complete both transcription and translation.
- \* Furthermore, the duration of effects depends on the half-life of mRNA and protein

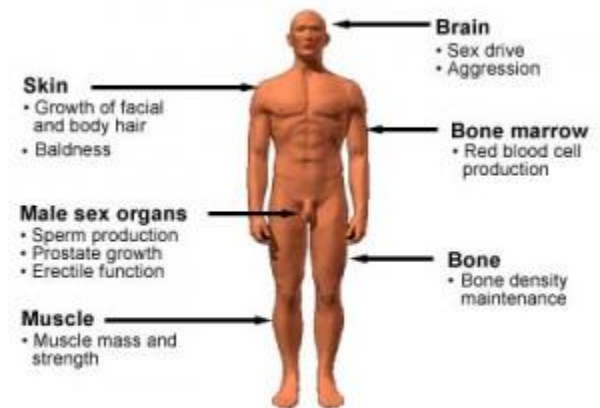
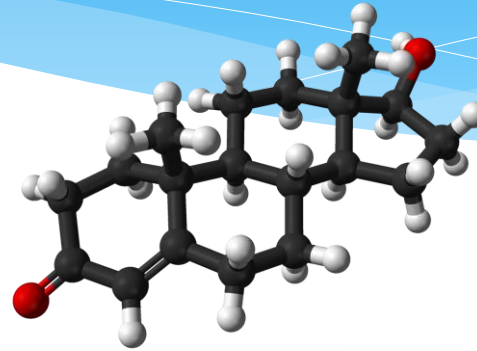


# Testosterone & Intracellular Receptors



# Testosterone

- ◆ **Testosterone**, a **steroid hormone**, is responsible for development of secondary sexual characteristics
- ◆ **Testosterone**, being a hormone, is a **signal** that starts a transduction pathway.
  - ◆ Lack of the testosterone receptors, as a result of a mutation, leads to a development of outward female characteristics
    - ◆ More to come on this genetic disorder

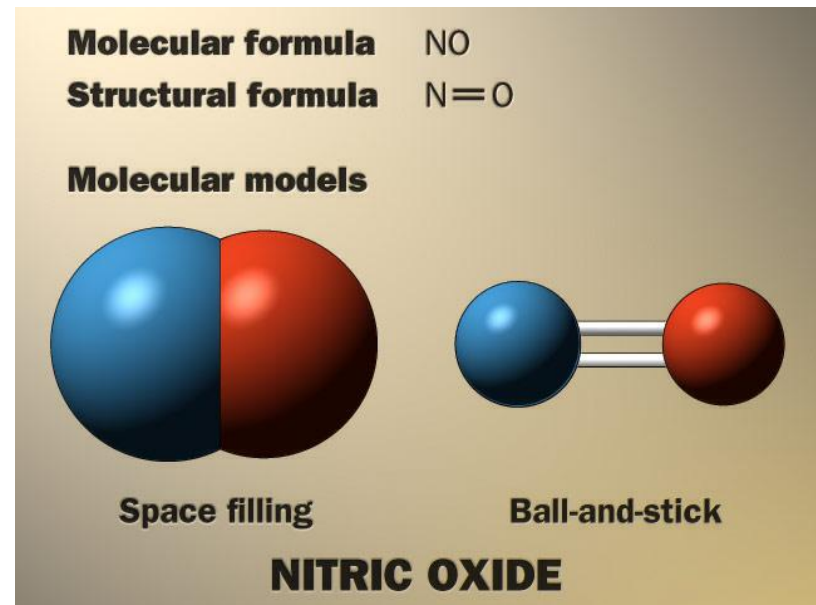


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# Nitric Oxide & Intracellular Receptors

# Nitric Oxide & Intracellular Receptors I

- \* Nitric Oxide is a signal that **initiates an intracellular pathway.**
- \* Nitric Oxide is **a dissolved gas** made from arginine (an amino acid)
  - \* Very localized.
- \* Nitric Oxide is used to activate an intracellular enzyme (protein/receptor) called **guananylate cyclase.**

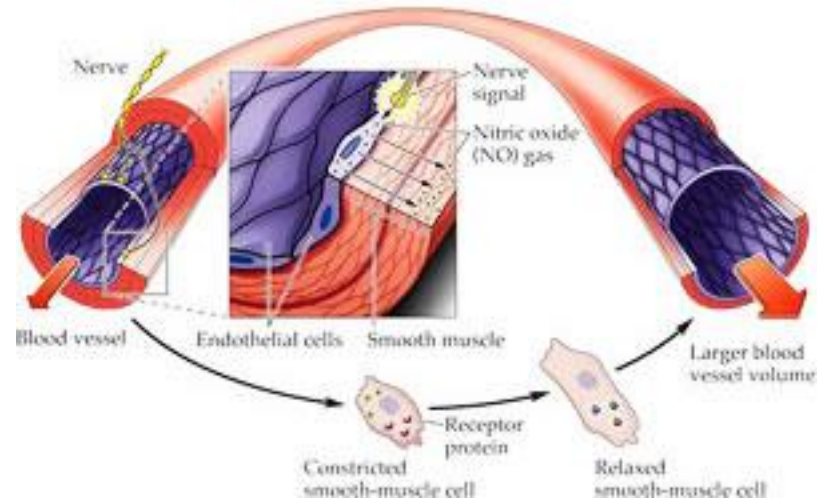


# Nitric Oxide & Intracellular Receptors

## II

- \* Nitric oxide is **released by endothelial cells** that line every blood vessel
- \* **Released in response to stimulation by nerve endings**
- \* Ultimately causes **blood vessel to dilate and relax**
  - \* Causing blood to flow more freely

### *The Science Behind Nitric Oxide*



# Nitric Oxide & Intracellular Receptors

## III

- \* During sexual stimulation, **within marriage**, nitric oxide is released by nerve terminals in the penis of males and clitoris of females.
  - \* Results in both organs becoming erect.
- \* Nitric oxide works *locally and quickly*.



# Nitric Oxide & Intracellular Receptors

## IV

- \* Individuals that lack the intracellular receptor, guananylate cyclase, may not be able to become sexually aroused and may have difficulty having children in the younger adult years.



# Nitric Oxide & Intracellular Receptors V

- \* Inactivation of these receptors may play a role in women during menopause.



Early Menopause Causes		
Natural causes	Medical causes	Other causes
<ul style="list-style-type: none"><li>• Premature ovarian failure (POF)</li></ul>	<ul style="list-style-type: none"><li>• Hysterectomy</li><li>• Chemotherapy, others</li></ul>	<ul style="list-style-type: none"><li>• Stress</li></ul>

# Nitric Oxide & Intracellular Receptors

## VI

- \* Drug nitroglycerine is used to treat patients with angina
- \* Pain due to inadequate blood flow to the heart muscle
- \* The drug is converted to NO in the body





# Review