

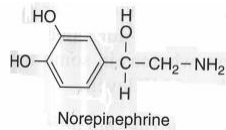
## ADRENAL MEDULLA Lecture 6 (Chapter 14)

### Catecholamines

#### 1) epinephrine (adrenaline)



#### 2) norepinephrine (noradrenaline)



#### 3) dopamine

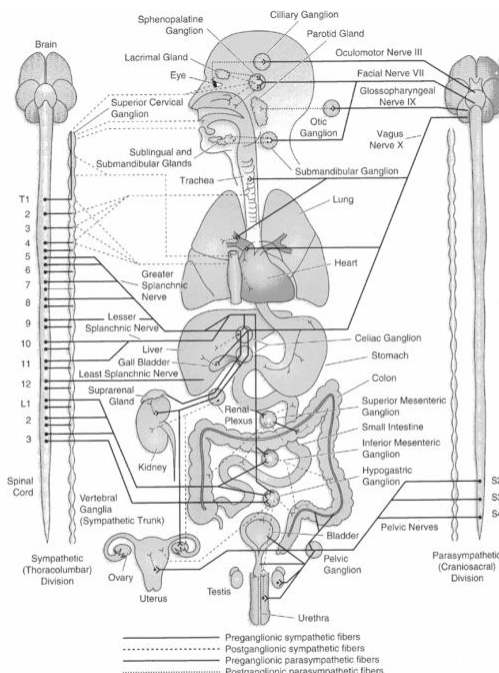


Figure 14.2 The autonomic nervous system. (From William F. Evans, *Anatomy and Physiology*, 2nd edn, p. 187. © 1976. Reproduced by permission of Prentice Hall, Inc., Englewood Cliffs, NJ.)

### Nervous System neurotransmitter hormones

#### I. CNS

#### II. PNS

A) SNS Ach

#### B) ANS

1) Parasympathetic (P)  
basal metabolism

2) Sympathetic (S)  
fight or flight

preganglionic neurons (spinal cord)

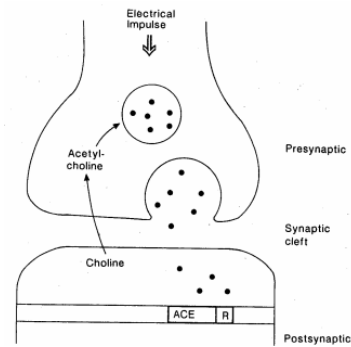
Ach →  
second neuron

Ach →

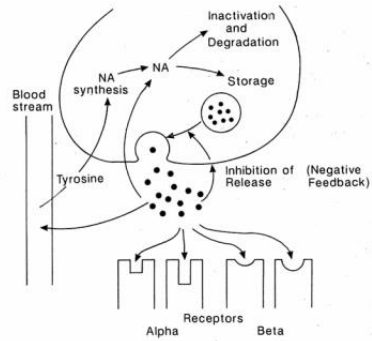
postganglionic neuron

Ach ← P ↓      ↓ S → NE  
target effect organ

## Postganglionic to Target Effector Organs



**P cholinergic transmission**



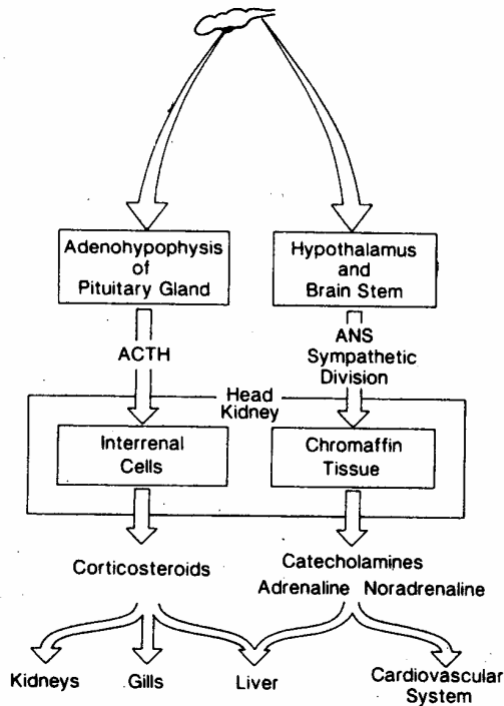
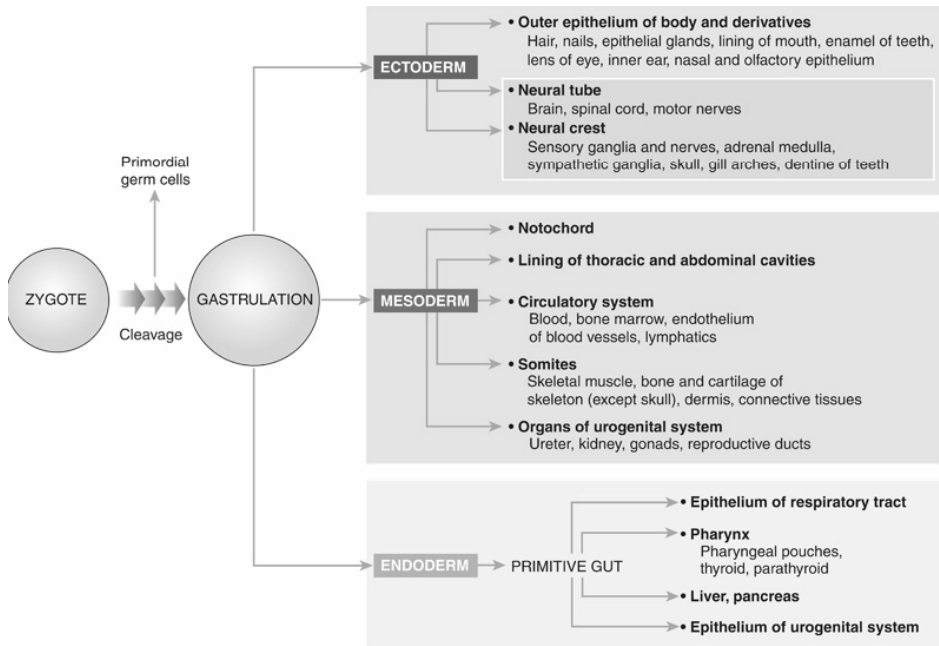
**S adrenergic transmission**

**neuroendocrine hormone**  
peptide

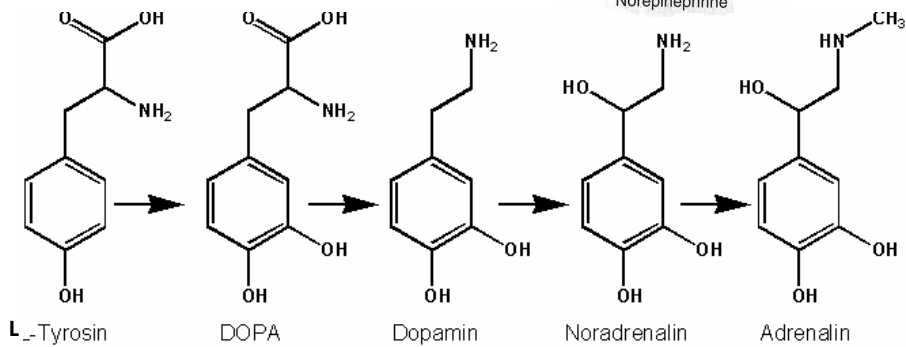
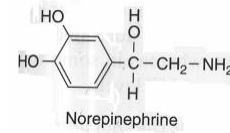
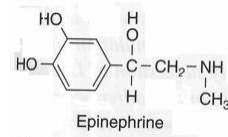
secreted from a nerve ending into bloodstream

reach target tissue

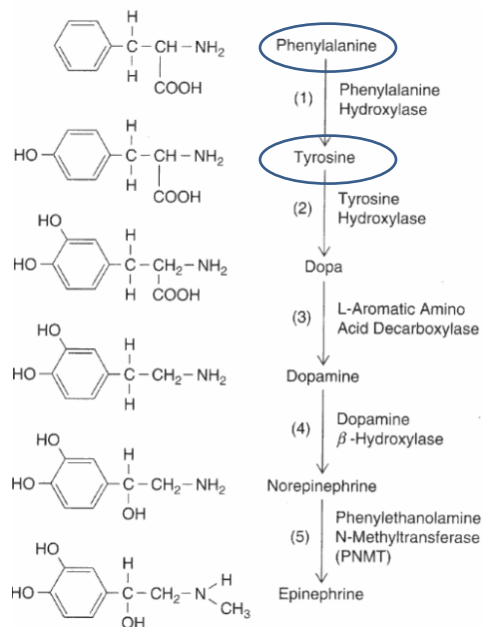
hormonal effect



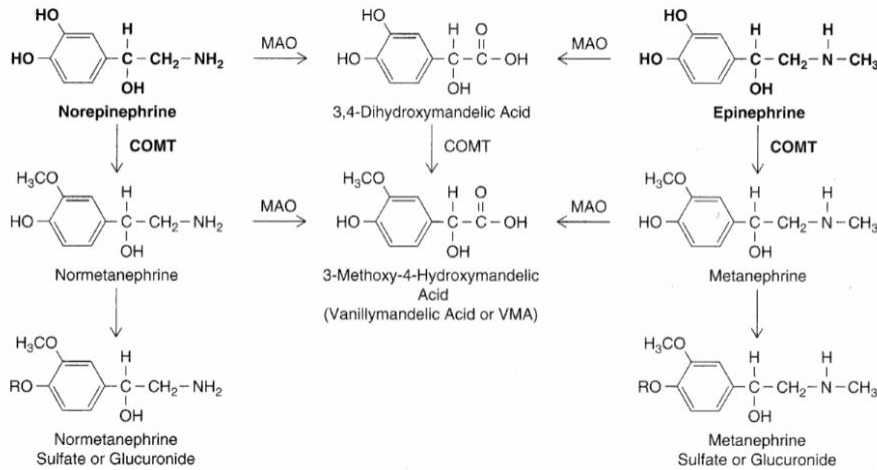
epinephrine  
 norepinephrine  
 dopamine  
 (adrenaline)  
 (noradrenaline)



## Pathways of Catecholamine Biosynthesis



## Pathways of Catecholamine Metabolism



## Historical Perspectives

- 1904 Stolz: first artificially synthesized
- 1886 Bates: adrenal gland substance in New York Medical Journal
- 1895 Cybulski: isolated & identified epinephrine
- 1897 Abel: repeated discovery
- 1900 Takamine: discovered same hormone
- 1904 Elliot: sympathetic nerve impulses released epinephrine-like substance
- 1905 Langley: autonomic effector cells possess inhibitory & excitatory substances  
suggestion of neurohumor  $\rightarrow$  neurotransmission
- 1906 Dale: epinephrine elicit two opposing actions in same tissue
- 1921 Loewi: vagus nerve  $\rightarrow$  excitatory epinephrine-like substance
- 1931 Bacq: sympathin  $\rightarrow$  norepinephrine
- 1921 Cannon & Bacq:  $\rightarrow$  referred this substance to sympathin  
 $\uparrow$  blood pressure & heart rate
- 1933 Cannon & Rosenblueth: 2 sympathins E (excitatory) & sympathin I (inhibitory)
- 1935 Bacq: sympathin not identical to E; against sympathin E & I;  
same catecholamine opposite effect
- 1946 Von Euler: postganglionic substance  $\rightarrow$  NE
- 1948 Ahlquist: dual adrenoceptors  $\rightarrow$  smooth muscle contraction & relaxation  $\rightarrow$   
a &  $\beta$  adrenoceptors  $\rightarrow$  **adrenoceptor hypothesis**
- 1952 Carlsson & Hillarp: discovered dopamine
- 2000 Carlsson: Nobel Prize in Physiology or Medicine  $\rightarrow$  dopamine neurotransmitter