Adrenal Medulla

Objectives:

- 1. To study the adrenal medulla hormone secretion.
- 2. To verify the effects of catecholamines and the disorders of their secretion.

The adrenal gland consists of 2 parts:

- 1. The outer part: the adrenal cortex which is part of the endocrine system,
- 2. The inner part: the adrenal medulla which is part of the autonomic nervous system.

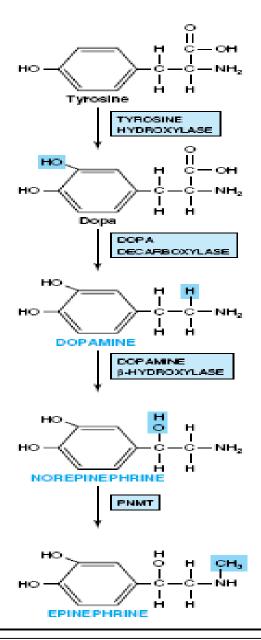
The adrenal medulla secrets catecholamines:-

- 1. Epinephrine (Adrenaline)
- 2. Norepinephrine (Noradrenaline)
- 3. Dopamine

Epinephrine is the major product of adrenal medulla and constitute 80% of catecholamines in the medulla and is not made in extramedullary tissues.

Catecholamines synthesis and secretion are regulated by neural impulses. They are synthesized from Tyrosine.

Biosynthesis of Catecholamines



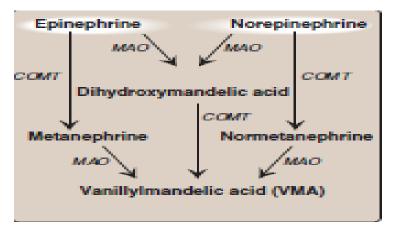
Granner DK. Diversity of the endocrine system. In: Murray RK, Granner DK, Mayes PA, Rodwell VW,eds. Harpers's Illustrated Biochemistry. 26th edn, New York: Lange Medical Books/McGraw-Hill; 2003: 434-455.

Metabolism of Catecholamines

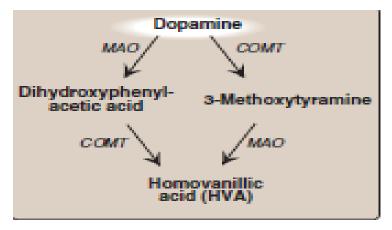
Catecholamines are inactivated by:

- 1. Oxidative deamination catalyzed by monoamine oxidase (MAO), and:
- 2. O-methylation carried out by catechol-O-methyl transferase (COMT).

Metabolism of Epinephrine and Norepinephrine



Metabolism of Dopamine



Harvey RA, Ferrier DR. Lippincott's Illustrated Reviews: Biochemistry. 5th edn. Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins; 2011: 277-290.

Effects of Catecholamines:

Catecholamines acts through 2 major classes of receptors, these are designated:

Alpha " α " adrenergic receptors (α 1 and α 2 adrenergic receptors), and:

Beta " β " adrenergic receptors (β 1, β 2 and β 3 adrenergic receptors).

Epinephrine binds to and activate *ALPHA* and *BETA* adrenergic receptors. Norepinephrine , at physiological concentrations, primarily binds to *ALPHA* adrenergic receptors.

Effects mediated via ALPHA-1 adrenergic receptors:

- 1. Stimulation of glycogenolysis
- 2. Smooth muscle contraction: Blood vessels Genitourinary system

Effects mediated via ALPHA-2 adrenergic receptors:

- 1. Smooth muscle relaxation in gasrointestinal tract
- 2. Smooth muscle contraction in some vascular beds
- 3. Inhibition of: Insulin secretion Renin secretion Platelets aggregation Lipolysis

Effects mediated via BETA-1 adrenergic receptors:

- 1. Stimulation of lipolysis
- 2. Increase the rate and force of myocardial contraction

Effects mediated via BETA-2 adrenergic receptors:

- 1. Stimulation of hepatic gluconeogensis
- 2. Stimulation of hepatic and muscle glycogenolysis
- 3. Smooth muscle relaxation in: Bronchi

Blood vessels

Gasrointestinal tract

Genitourinary system

• 4. Stimulation of secretion of: Insulin Renin Glucagon

Effects mediated via BETA-3 adrenergic receptors:

• Stimulation of lipolysis

Pathophysiology

Phaeochromocytoma:

This tumour is associated with excessive secretion of catecholamines, and is responsible for < 0.1% of causes of hypertension.

The patient presented with paroxysmal hypertension or with it's complications.

Investigations:

- 1. 24 hr Urinary Metanephrines.
- 2. Plasma Metanephrines.