

ADRENAL MEDULLA

Medulla is the inner part of adrenal gland and it form 20% of the mass of adrenal gland. It is made up of interlacing cords of cells known as chromaffin cells.

Types of chromaffin cells

Adrenal medulla is formed by two types of chromaffin cells:

1. Adrenaline-secreting cells (90%)
2. Noradrenaline-secreting cells (10%).

HORMONES OF ADRENAL MEDULLA

Adrenal medullary hormones are the amines derived from catechol and so these hormones are called catecholamines.

Catecholamines secreted by adrenal medulla

1. Adrenaline or epinephrine
2. Noradrenaline or norepinephrine
3. Dopamine.

SYNTHESIS OF CATECHOLAMINES

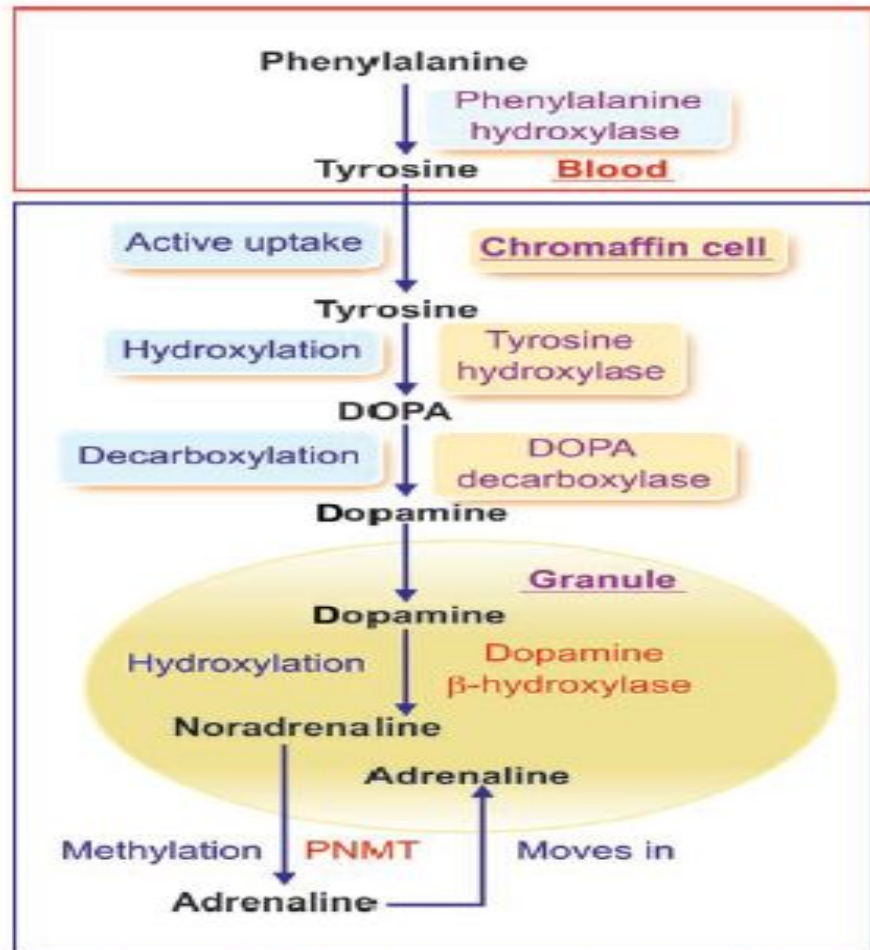


FIGURE 71.1: Synthesis of catecholamines. DOPA = Di-hydroxyphenylalanine, PNMT = Phenylethanolamine-N-methyltransferase.

ACTIONS OF ADRENALINE AND NORADRENALINE

On Metabolism (via Alpha and Beta Receptors)

Adrenaline influences the metabolic functions more than noradrenaline.

- i. General metabolism: Adrenaline increases oxygen consumption and carbon dioxide removal. It increases basal metabolic rate. So, it is said to be a calorogenic hormone
- ii. Carbohydrate metabolism: Adrenaline increases the blood glucose level by increasing the glycogenolysis in liver and muscle.
- iii. Fat metabolism: Adrenaline causes mobilization of free fatty acids from adipose tissues.

On Blood (via Beta Receptors)

Adrenaline decreases blood coagulation time. It increases RBC count in blood

3. On Heart (via Beta Receptors)

Adrenaline has stronger effects on heart than noradrenaline.

It increases overall activity of the heart, i.e.

- i. Heart rate (chronotropic effect)
- ii. Force of contraction (inotropic effect)
- iii. Excitability of heart muscle (bathmotropic effect)
- iv. Conductivity in heart muscle (dromotropic effect).

4. On Blood Vessels (via Alpha and Beta-2 Receptors)

Both the hormones have Vasoconstrictor effect

5. On Blood Pressure (via Alpha and Beta Receptors)

Adrenaline increases systolic blood pressure by increasing the force of contraction of the heart and cardiac output. But, it decreases diastolic blood pressure.

Noradrenaline increases diastolic pressure It also increases the systolic blood pressure to a slight extent.

Hence, hypersecretion of catecholamines leads to hypertension.

6. On Respiration (via Beta-2 Receptors)

Adrenaline increases rate and force of respiration. It also causes bronchodilation.

7. On Skin (via Alpha and Beta-2 Receptors)

Adrenaline increases the secretion of sweat.

8. On Skeletal Muscle (via Alpha and Beta-2 Receptors)

Adrenaline causes severe contraction of skeletal muscle. It increases glycogenolysis and release of glucose from muscle into blood.

9. On Smooth Muscle (via Alpha and Beta Receptors)

Catecholamines cause contraction of smooth muscles in the following organs:

Sphincters of gastrointestinal (GI) tract

Arrector pili of skin

Gallbladder

Uterus

Dilator pupillae of iris

Catecholamines cause relaxation of smooth muscles in the following organs:

i. Non-sphincteric part of GI tract (esophagus, stomach and intestine)

ii. Bronchioles

iii. Urinary bladder.

10. On Central Nervous System (via Beta Receptors)

Adrenaline increases the activity of brain. Adrenaline secretion increases during 'fight or flight reactions' after exposure to stress. It enhances the cortical arousal and other facilitatory functions of central nervous system.

DOPAMINE

Dopamine is secreted by adrenal medulla. Dopamine is also secreted by neurons in some areas of

brain, In brain, this hormone acts as a neurotransmitter.

Injected dopamine produces the following effects:

1. Vasoconstriction by releasing norepinephrine
2. Increase in heart rate via beta receptors
3. Increase in systolic blood pressure. Dopamine does not affect diastolic blood pressure.

Pheochromocytoma

Pheochromocytoma is a condition characterized by hypersecretion of catecholamines.

Cause

Pheochromocytoma is caused by tumor of chromophil cells in adrenal medulla.

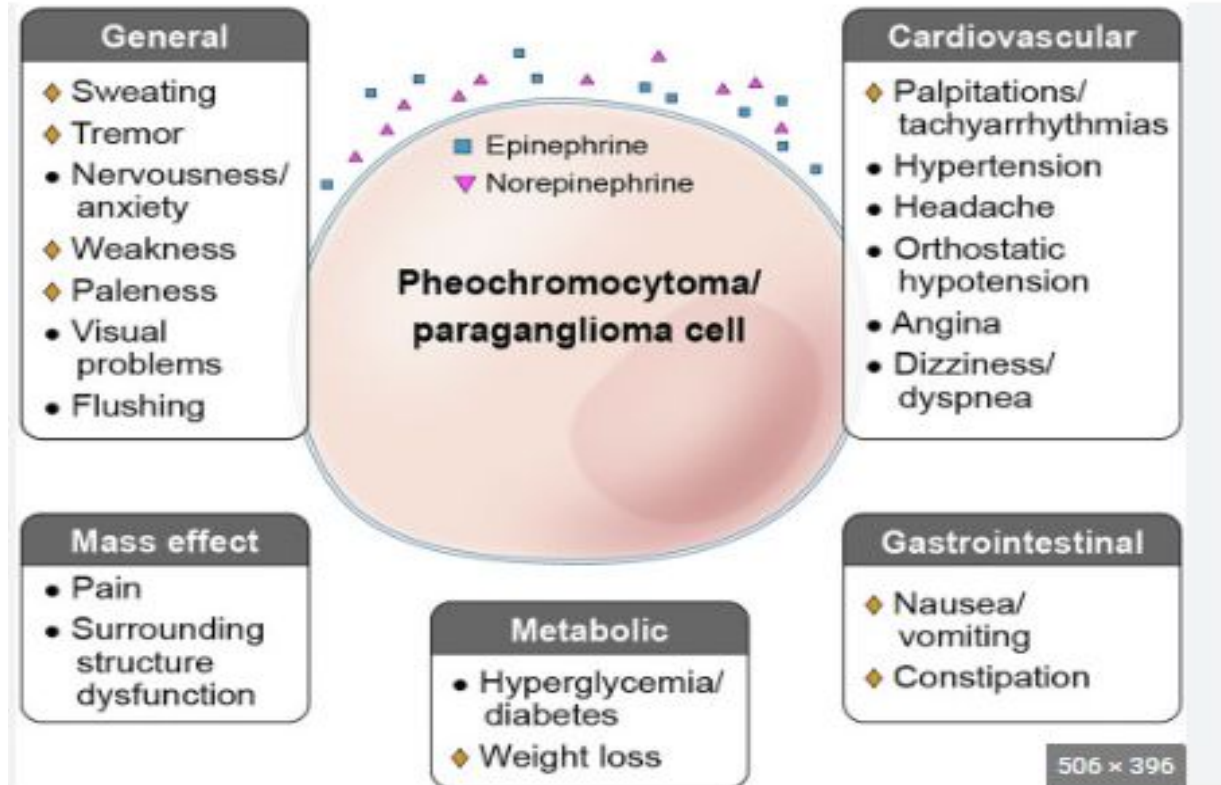
Signs and Symptoms

Characteristic feature of pheochromocytoma is hypertension. This type of hypertension is known as endocrine or secondary hypertension.

Other features:

1. Anxiety
2. Chest pain
3. Fever
4. Headache
5. Hyperglycemia
6. Metabolic disorders
7. Nausea and vomiting
8. Palpitation
9. Polyuria and glucosuria
10. Sweating and flushing
11. Tachycardia
12. Weight loss.

Pheochromocytoma



Thank you