



Clinical Endocrinology

Middle Lobe of Pituitary and Posterior Pituitary Gland

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كلية التقنيات الصحية والطبية

قسم تقنيات المختبرات الطبية

المرحلة الثالثة

محاضرة رقم 6

Lecture No. 6

الجانب النظري

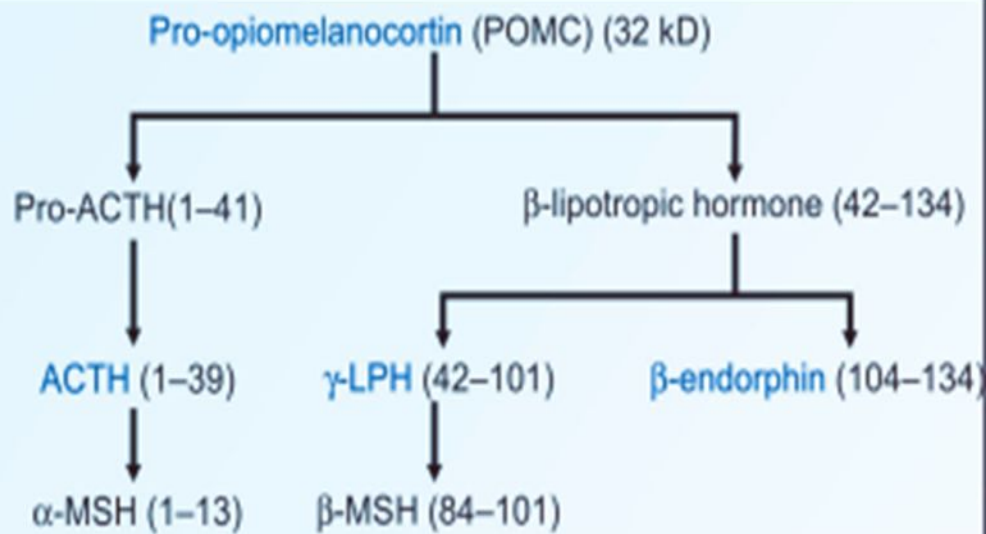
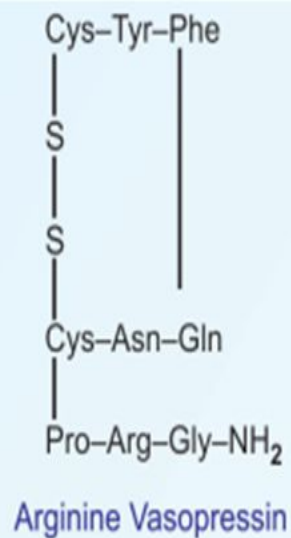
Theoretical

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تدريسي المادة : م.م عقيل محمد رسول

Hormone of Middle Lobe of Pituitary

* **Melanocyte Stimulating Hormones**: The hormones **secreted by intermediate lobe or middle lobe of pituitary gland are called** melanocyte-stimulating hormones or MSH. **POMC** is the precursor molecule which is **cleaved by proteases to give ACTH and β -lipotropin**. The **ACTH** is further cleaved to (**β -MSH**) which has 13 amino acids. There is also **α -MSH** which **is present in larger quantities**. Amino acids 11-17 of β -MSH are common to both α -MSH and ACTH. ***MSH darkens the skin*** and is involved in skin pigmentation **by deposition of melanin by melanocytes**.



Hormones of Posterior Pituitary Lobe

The hormones have been isolated and characterized from extracts of posterior pituitary gland. **They are:**

1. Vasopressin (**Pitressin**) or Arginine Vasopressin (**ADH**)
2. Oxytocin.

Both are **small peptides** containing **nine amino acids**. **Oxytocin differs from Vasopressin** with respect to *3rd and 8th amino acid residues*.

Posterior pituitary hormones are **synthesized** in **neurosecretory neurons**. They are **stored** *in the pituitary* in *association with two proteins neurophysin I and II*. The release of these two hormones is independent of each other.

A. Metabolic Role of Vasopressin

1. **Antidiuretic action:** **Antidiuretic effect** is its **main function**. It reabsorbs water from the kidneys by distal tubules and collecting ducts. It is found to be **mediated** through formation of c-AMP. **It is released** due to **rise in plasma osmolarity**. This **leads to** formation of hypertonic urine having low volume, high sp. gr. and high conc. Of Na⁺, Cl⁻, phosphate and urea.
2. **Urea-retention effect:** Permeability of medullary collecting ducts to urea is **increased by vasopressin**. This leads to retention of urea and subsequently contributes to **hypertonicity of the medullary interstitium**. Urea retention effect can be **reversed by phloretin**.
3. **Pressor effect:** It **stimulates** the contraction of smooth muscles and thus causes vasoconstriction **by increasing cytosolic Ca⁺² concentration**.
4. **Glycogenolytic effect:** By increasing **intracellular calcium concentration**.

Clinical Importance

- Condition of **diabetes insipidus** is described **due to failure in secretion or action of vasopressin**. It is characterized by very high volumes of urine output, up to 20-30 litres per day with a low specific gravity and excessive thirst.
- In primary, central or neurohypophyseal diabetes insipidus, **vasopressin secretion is poor**.
- In nephrogenic diabetes insipidus, kidneys cannot respond to vasopressin due to **renal damage**.
- Inappropriate vasopressin secretion is **characterized by** a persistently hypertonic urine, progressive renal loss of Na^+ with low plasma levels of Na^+ , **symptoms of water intoxication** like drowsiness, irritability, nausea, vomiting, convulsions, stupor and coma. It could be **due to** pulmonary infection and ectopic ADH secretions from lung tumors.

B. Metabolic Role of Oxytocin

Contraction of smooth muscle is the primary function of oxytocin. There are basically **two effects**, one on mammary glands called as galactobolic effect and the other on uterus called as uterine effect.

1. Galactobolic effect: This is **released** due to **Neuroendocrinal reflex** such as **suckling of nipples**. By doing so it causes the contraction of myoepithelial cells around mammary alveoli and ducts and the smooth muscles surrounding the mammary milk sinuses;

□ **estrogen increases the number of oxytocin receptors during pregnancy**

□ while **progesterone decreases the same** and also **inhibits the secretion of oxytocin.**

2. Uterine effect: It is found to be **elevated at full term pregnancy. It causes contraction of uterine muscle for child-birth. Estrogens enhance while progesterone decreases oxytocin receptors as well as its secretion. Oxytocin is also secreted during coitus by the female uterus which promotes the aspiration of semen into the uterus.**

Questions :

- 1. What is the galactobolic effect of oxytocin?**
- 2. How does suckling stimulate oxytocin release?**
- 3. What is the primary function of MSH?**

Learning Resources for Hormone Mechanisms

Here are excellent sources to deepen your understanding of this topic:

Medical Textbooks:

"Harper's Illustrated Biochemistry" (Chapter on Hormones & Signal Transduction): Provides a detailed, yet clear, biochemical perspective on second messenger systems.

"Guyton and Hall Textbook of Medical Physiology" (Chapter 74: Introduction to Endocrinology): Excellent for understanding the physiological principles of hormone-receptor interactions and signaling.

"Greenspan's Basic & Clinical Endocrinology": A comprehensive resource that links basic mechanisms to clinical practice.

YouTube Channels:

Armando Hasudungan: His detailed drawings are fantastic for visualizing signal transduction pathways.

Dr. Najeeb Lectures: Provides extremely detailed lectures on the entire process.