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THE CHEMISTRY OF OXYTOCIN: A SHORT REVIEW

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Abstract:

Oxytocin, hormone obtained from posterior lobe of pituitary gland (ductless glands) is the nonapeptide plays a vital role in the body.Oxytocin contains nine Amino acids. Out of nine Amino acids, 3 Amino acids form tail of the cyclic peptide part and six Amino acids forms a cyclic peptide system attached to the tail of the 3 Amino acids with disulphide bridge. Normally, oxytocics are used to induce labor in obstetrical practices, hemorrhage & for control of post-partum uterine atony as well as for therapeutic abortion induction.

Key Words: Oxytocin, Oxytocicactivity & Methylsergide

Introduction:

Oxytocin, hormone secreted from the posterior lobe of pituitary gland. Hormone (a Greek word hormaein-to stir up), substance produced from specific cells and transported by circulation to its target cells within the body that carries intense biological activity. Primarily, Hormones are secreted from ductless glands such as pituitary, thyroid, parathyroid, pancreas, adrenals & gonads. Posteriorly, hormones in pituitary glandsi.e. oxytocin and ADH plays a vital role within thebody.[1]

In other words, oxytocin is nonapeptide secreted posteriorly from pituitary gland along with ADH (vasopressin). In 1835, Nicholas Farraye (a great Italian Scientist) discovered oxytocin as neurotransmitter present in brain and carries molecular formula of $C_{43}H_{66}N_{12}O_{12}S_2$ [with]structural similarity with vasopressin. In 1909, for the first-time oxytocin was used in labor as extract from pituitary gland. In 1953, oxytocin having ADH & uterine stimulating activities resolved after separation on chemical & synthesis purpose by du Vigneaud (the American biochemist) & his coworkers. [2]

In hypothalamus, two major neurons as oxytocin & vasopressin originated from supraoptic & para ventricular nuclei as a site of biosynthesis of actual site & named as neurophysins. Among two hormones, Oxytocin having powerful oxytocic action. On the other hand, vasopressin regulates the water reabsorption from renal tubules and carries antidiuretic action. [3]

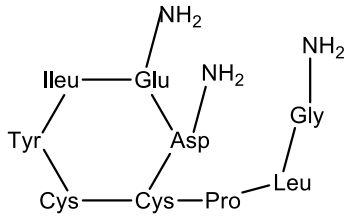
Chemistry:

Oxytocin contains nine Amino acids. Out of nine Amino acids, 3 Amino acids form tail of the cyclic peptide part and six Amino acids forms a cyclic peptide system attached to the tail of the 3 Amino acids with disulphide bridge.[4]

In 1954, du Vigneaudsynthesized the oxytocin for first time & got noble prize in 1955 for work of peptide hormone.[5]

Mechanism of Action:

Oxytocin as uterine smooth muscle contractors stimulates the frequency & force of contraction of uterine. It stimulates the myoepithelium of mammary glands that causes milk ejection by regulation of prolactin. Oxytocin, act specifically on G-protein along with the coupling of oxytocin receptors by mediating response mainly by muscle fibers depolarization and carries Ca^{2+} ion influx through hydrolysis of phosphoinositide & IP_3 intracellularly.[6,7]

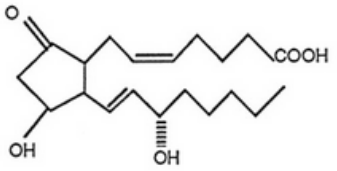


Oxytocin Structure

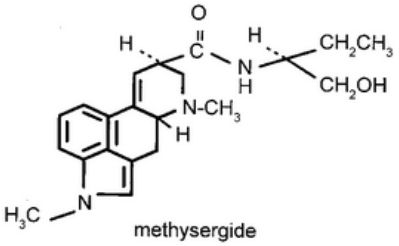
Pharmacological Properties:

- ✓ In breast, oxytocin contracts mammary alveoli at myoepithelium and initiates milk ejection reflex by suckling of infantused in milch cattle.
- ✓ Oxytocin functions as peptide neurotransmitter in brain stem & hypothalamus part of brain.

- ✓ It induces the release during labor due to sensitivity of uterus and not receiving any obligatory property.[8]
- ✓ Oxytocics, drugs which induces the uterus smooth muscles. Oxtocics also called uterine stimulating agents.[9]
- ✓ Normally, oxytocics are used to induce labor in obstetrical practices, hemorrhage& for control of post-partum uterine atony as well as for therapeutic abortion induction.[10]
- ✓ Officially, oxytocin (BP), oxytocin Bulk solution (BP), prostaglandins such as Prostaglandin E_2(PGE_2), Prostaglandin $E_{2\alpha}$ ($PGE_{2\alpha}$)& synthetic derivative as 15-methye $PGE_{2\alpha}$. having oxytocic activities.[11]
- ✓ Other drugs categorized as oxytocics also having ergot alkaloids & their derivatives as Ergometrine maleate[12], methysergide[13] are synthetically prepared.



PGE_2



methysergide

Conclusion:

Oxytocin, nonapeptide secreted by the posterior lobe of pituitary lobe along with the ADH (Vasopressin) carries nine amino acids. Among all six forms cyclic chain and 3 attaches to the cyclic peptide system as a tail. Principally, it carries oxytocic activity in the mammary gland of breast of female and induces uterus smooth muscles in the body. Medicinally, oxytocicsare uterine stimulating agents weather produced naturally and synthetically as 15-methye $PGE_{2\alpha}$, Ergometrine maleate, methysergide for use.

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