

Love – Role of Neurochemicals (Hormones) Behind This

Mahendra Dwivedi

Department of Pharmacy, Rajarshi Rananjay Singh College of Pharmacy,
Amethi, Uttar Pradesh, India.

***Corresponding Author**

Email Id: mahendradwivediji@gmail.com

ABSTRACT

In simple words, “Love is like an addiction in which various types alteration occurs in body’s neurochemicals (i.e. Phenyl ethyl amine, serotonin, dopamine, epinephrine, non-epinephrine, oxytocin, testosterone, oestrogen etc”. There are various neurochemicals in our body which are having different function, which are as follows— a) PEA (Phenyl Ethyl Amine), b) Non-Epinephrine and Dopamine, c) Serotonin, d) Testosterone and Oestrogen, e) Oxytocin and Vasopressin. Love is deeply biological. It pervades every aspect of our lives and has inspired countless works of art. Love also has a profound effect on our mental and physical state. A 'broken heart' or a failed relationship can have disastrous effects; bereavement disrupts human physiology and might even precipitate death.

Keywords: Neurochemicals, PEA (Phenyl ethyl amine), Non-epinephrine, Dopamine, serotonin, oxytocin, Vasopressin, oestrogen.

INTRODUCTION

According to a team of scientists led by Dr. Helen Fisher at Rutgers, romantic love can be broken down into three categories: lust, attraction, and attachment. Each category is characterized by its own set of hormones stemming from the brain. (Table 1).

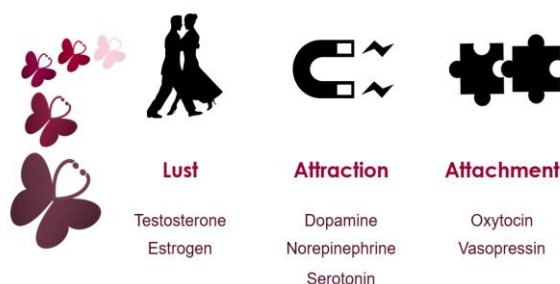


Fig. 1. Representing the Three Categories of Love

Lust

Lust is driven by the desire for sexual gratification. The evolutionary basis for this stems from our need to reproduce, a need shared among all living things. Through reproduction, organisms pass on their genes, and thus contribute to the perpetuation of their species. The hypothalamus of the brain plays a big role in this, stimulating the production of the sex hormones testosterone and estrogen from

the testes and ovaries. These hormones are responsible for sex and pass time with each other [1].

Testosterone

Testosterone is the primary male sex hormone; testosterone plays a key role in the development of male reproductive tissues such as testes and prostate, as well as promoting secondary sexual characteristics such as increased muscle

and bone mass, and the growth of body hair. In addition, testosterone is involved in health and well-being and the prevention of osteoporosis. Insufficient levels of testosterone in men may lead to abnormalities including frailty and bone loss. Testosterone is present in both i.e. male and female (in very trace amount) [2].

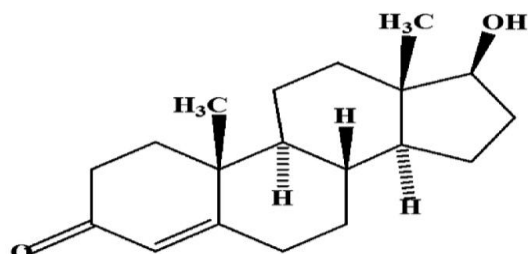


Fig. 2. Showing Chemical Structure of Testosterone

Estrogen

Estrogen, or oestrogen, is the primary female sex hormone. It is responsible for the development and regulation of the female reproductive system and secondary sex characteristics. There are three major endogenous estrogens in females that have estrogenic hormonal activity: estrone (E1), estradiol (E2), and estriol (E3). Estradiol, an estrane, is the most potent and prevalent. Another estrogen called estetrol (E4) is produced only during pregnancy.[3]

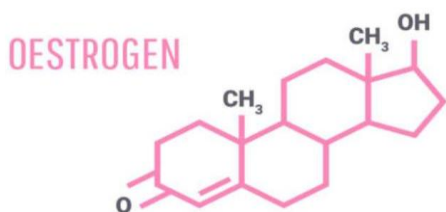


Fig. 3. Showing Chemical Structure of Oestrogen

Attraction

Attraction seems to be a distinct, though closely related, phenomenon. While we can certainly lust for someone we are attracted to, and vice versa, one can happen without the other. Attraction involves the brain pathways that control

“reward” behaviour, which partly explains why the first few weeks or months of a relationship can be so exhilarating and even all-consuming. Dopamine and Norepinephrine play main role for attraction and are responsible for—

- 1) Feeling of love
- 2) Shortness of sleep
- 3) Decrease appetite
- 4) Always missing to his/her partner

Norepinephrine

Norepinephrine (NE), also called noradrenaline (NA) or noradrenalin, is an organic chemical in the catecholamine family that functions in the brain and body as a hormone and neurotransmitter. The name "noradrenaline", derived from Latin roots meaning "at/alongside the kidneys", is more commonly used in the United Kingdom; in the United States, "norepinephrine", derived from Greek roots having that same meaning, is usually preferred [1,4].

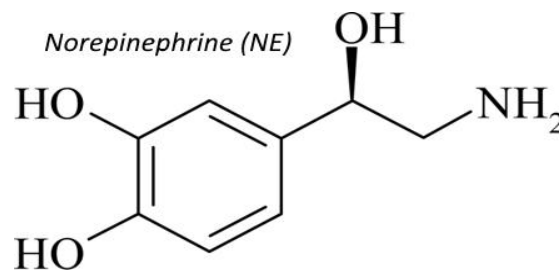


Fig. 4. Showing Chemical Structure of Norepinephrine

Dopamine

Dopamine (DA, a contraction of 3,4-dihydroxyphenethylamine) is a hormone and a neurotransmitter that plays several important roles in the brain and body. It is an organic chemical of the catecholamine and phenethylamine families. It is an amine synthesized by removing a carboxyl group from a molecule of its precursor chemical L-DOPA, which is synthesized in the brain and kidneys. Dopamine is also synthesized in plants and most animals. [5].

DOPAMINE

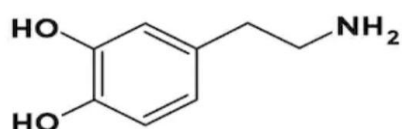


Fig. 5. Showing Chemical Structure of Dopamine

Serotonin

Serotonin or 5-hydroxytryptamine (5-HT) is a monoamine neurotransmitter. Its biological function is complex and multifaceted, modulating mood, cognition, reward, learning, memory, and numerous physiological processes such as vomiting and vasoconstriction [6]. Serotonin is mainly responsible for happiness.

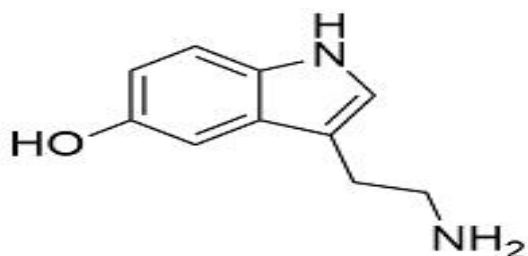


Fig. 6. Showing Chemical Structure of Serotonin

Attachment

Attachment is the predominant factor in long-term relationships. While lust and attraction are pretty much exclusive to romantic entanglements, attachment mediates friendships, parent-infant bonding, social cordiality, and many other intimacies as well. The two primary hormones here appear to be oxytocin and vasopressin. Oxytocin and Vasopressin are responsible for long time relationship (Deep love).

Oxytocin

Oxytocin is a peptide hormone and neuropeptide. It is normally produced in the hypothalamus and released by the posterior pituitary. It plays a role

in social bonding, sexual reproduction, childbirth, and the period after childbirth. Oxytocin, known also as the love hormone, provokes feelings of contentment, calmness, and security, which are often associated with mate bonding [1,7,8].

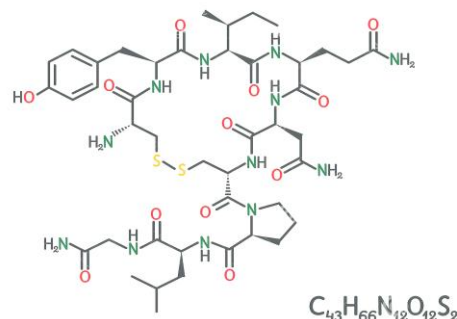


Fig.7. Chemical Structure of Oxytocin

Vasopressin

Vasopressin is linked to behaviour that produces long-term, monogamous relationships. ... "That's the neural basis for the ancient wisdom 'love is blind'," said Schwartz. Vasopressin, also called antidiuretic hormone (ADH), arginine vasopressin (AVP), is a hormone synthesized as a peptide prohormone in neurons in the hypothalamus, and is converted to AVP [9]

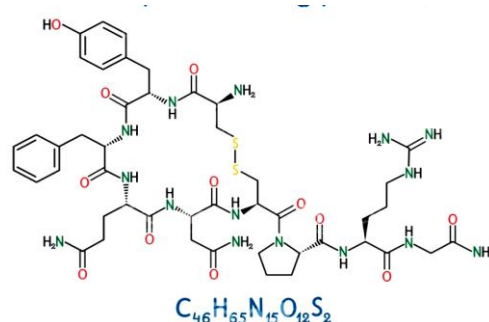


Fig. 8. Vasopressin (Argipressin)

Except above explained neurochemicals there is one more major chemical which play a vital role in love (i.e. Phenyl ethyl amine)

Phenyl ethyl amine (PEA)

This is a chemical that naturally found in the brain and also found in many foods as chocolate *etc.*

- 1) In mammals, phenethylamine is produced from the amino acid L-phenylalanine by the enzyme aromatic L-amino acid decarboxylase via enzymatic decarboxylation.
- 2) It is an stimulant much like an amphetamine that causes the release of non-epinephrine and Dopamine. [10]

Role of PEA (Phenyl Ethyl amine) :-

- 1) This is found in all person's brain, but in lovers its secretion increase.
- 2) But not all time its level remains constant, after a few time its level decrease in lovers.
- 3) It skips all faults & opposite points of your partner from your mind. And lovers starts to love their partner opposite points also.
- 4) Chocolate also contains phenyl ethylamine, a chemical related to amphetamines and raises blood pressure and blood glucose levels. The results is that we feel more alert and gives us a sense of well being and contentment. It is believed to work by making the brain release b-endorphin, an opioid peptide which is the driving force behind the pleasurable effects

Phenyl ethylamine is known as the "love drug" and is thought be the reason why chocolate is said to be an aphrodisiac. It is a chemical that mimics the brain chemistry of a person in love, so when levels of phenyl ethylamine are high in the body it relieves depression from unrequited love. This is one of the reasons so many women love chocolate - it really is a mood elevator. [11]

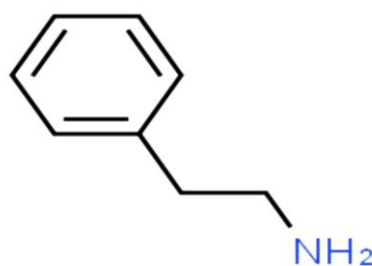


Fig. 9. Chemical Structure of Phenyl ethylamine

CONCLUSION

Love is a drug. ---Helen Fisher (Anthropologist at Rutgers University) Except these neurochemicals, different organ of body play a key role for love. Among them eyes are mainly responsible for attraction. Nose also plays a key role for love feeling.

- 1) Love is deeply biological. ... Without loving relationships, humans fail to flourish, even if all of their other basic needs are met. As such, love is clearly not 'just' an emotion; it is a biological process that is both dynamic and bidirectional in several dimensions
- 2) Although love has been a topic for philosophers and poets, there is an actual science to love. Being in love is affected by huge, measurable changes in the biochemistry of the brain. Science has identified three basic parts of love (lust, attraction, attachment) each driven by a unique blend of brain chemicals.

There are following factors which attracts one another –

55%	Body language & Personality
38%	Talking manner
7%	Communication skills

Abnormal level of these hormones disturb to normal life.

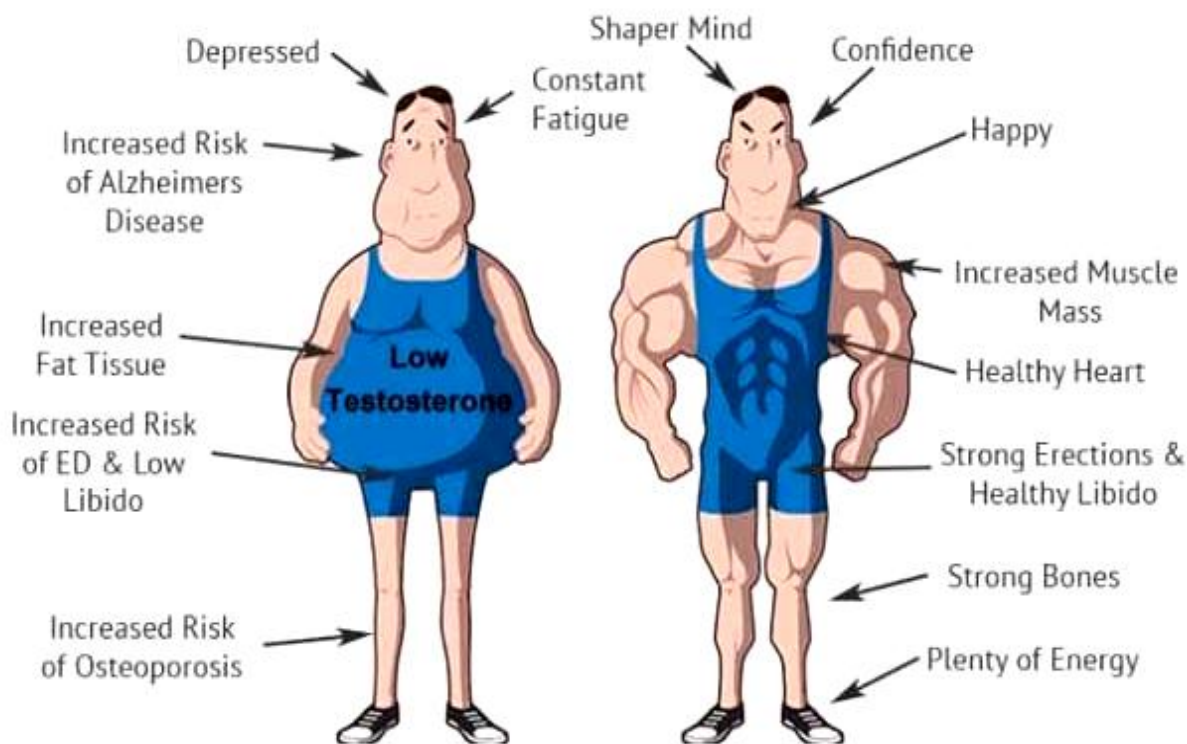


Fig. 10. Benefits of Optimal Testosterone

REFERENCES

- 1) <http://sitn.hms.harvard.edu/flash/2017/love-actually-science-behind-lust-attraction-companionship/>
- 2) <https://en.wikipedia.org/wiki/Testosterone>
- 3) <https://en.wikipedia.org/wiki/Estrogen>
- 4) <https://en.wikipedia.org/wiki/Norepinephrine>
- 5) Dopamine: Biological activity". *IUPHAR/BPS guide to pharmacology*. International Union of Basic and Clinical Pharmacology. Retrieved 29 January 2016.
- 6) Young SN (November 2007). "How to increase serotonin in the human brain without drugs". *Journal of Psychiatry & Neuroscience*. **32** (6): 394–9. PMC 2077351. PMID 18043762
- 7) *Gray's Anatomy: The Anatomical Basis of Clinical Practice* (41 ed.). Elsevier Health Sciences. 2015. p. 358. ISBN 978-0-7020-6851-5.
- 8) Yang HP, Wang L, Han L, Wang SC (2013). "Nonsocial functions of hypothalamic oxytocin". *ISRN Neuroscience*. 2013: 179272. doi:10.1155/2013/179272. PMC 4045544. PMID 24967304
- 9) Anderson DA (2012). *Dorland's Illustrated Medical Dictionary* (32nd ed.). Elsevier. ISBN 978-1-4160-6257-8.
- 10) <https://en.wikipedia.org/wiki/Phenethylamine>
- 11) <http://www.chm.bris.ac.uk/webprojects/2001/millward/phenylethylamine.htm#:~:text=Phenylethylamine%20is%20known%20as%20the,relieves%20depression%20from%20unrequited%20love.>