



The Chemistry of Love and Hate

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Love, Hate ,Brain, Hormones

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ABSTRACT

Love produces in us the feeling of living together and being trustful toward our partner. It keeps people to go on together for a long time and hate is something which becomes hurdle to go with anyone further. Trust plays a vital role in love. There are many chemicals involved in love and hate. It has been shown by the scientists that same circuit of brain is being used in love and hate

A lot of research work has been done by different workers to see state of mind of a person who is in love (Zeki, 2007), being in love (Acevedo, Aron, Fisher, & Brown, 2011; Fisher, Aron, & Brown, 2006; Ortigue, Bianchi-Demicheli, Patel, Frum, & Lewis, 2010) as well as those following a romantic break up (Fisher, Brown, Aron, Strong, & Mashek, 2010; Kross, Berman, Mischel, Smith & Wager, 2011), little is known about the chemistry of the brain during the experience of falling out of romantic love.

Certain chemicals involved in chemistry of love are;

DHEA(dehydroepiandrosterone) it is secreted by adrenal glands, most of sex hormones as well as pheromones are derived from it.

Pheromones- it signals for both sexes and is sensed by the vomeronasal organs.

Oxytocin- released by pituitary glands when touched by loved one

PEA(phenylethylamine)- it is called molecule of love, euphoria and is produced in brain capillaries (endothelium)

Estrogen- it makes women sexually attractive and receptive

Testosterone- it increases sex drive in both sexes

Endorphins- produced in the brain, it is also released in response to touch

Progesterone- it is testosterone antagonist, it lowers sex drive, and it is sedative and causes calmness

Serotonin- it is a neurotransmitter at low level it intensifies sex drive and at high level it decreases it.

Dopamine- this is a neurotransmitter associated with all pleasure, it increases sex drive.

Prolactin- it decreases sex drive, especially in men

Vasopressin- it is a hormone produced by pituitary gland, it increases blood pressure, and also increases focus in love-making

All the above chemicals fluctuate during the day and with age and environmental events. While in love there is feel-

ings of exhilaration, intrusive thinking about the loved one, and a craving for emotional union with the partner (Fisher, Aron, Mashek, Li, & Brown, 2002; Zeki, 2007). These feelings, thoughts, and cravings are brought on by changes in brain activity and peripheral hormonal levels (Schneiderman, Zilberstein-Kra, & Leckman, 2011). There is a complex interplay between hormones and neurotransmitters at work in the human brain during this time.

There are reports that elevated levels of central dopamine and norepinephrine and decreased levels of central serotonin (Fisher et al., 2002; Zeki, 2007) play a central role in the focused attention, motivation, and goal-oriented behaviors associated with romantic love. Feelings of exhilaration and euphoria are experienced as a result of the dopamine being produced in the brain of a person in the throes of love (Zeki, 2007). Dopamine and phenylethylamine work in combination on the reward pathways of the brain that leads from the limbic system to the cerebral cortex (Carter, 1998; Zeki, 2007).

Bonding, both for sexual intimacy and parent-child connectedness are created by the brain hormone, oxytocin (Schneiderman, Zilberstein-Kra, & Leckman, 2011; Zeki, 2007). It is created in the hypothalamus. When released in the brain, oxytocin is known to produce the sensation of satisfaction or gratitude (Freeman, 1995). This bonding may be the chemical basis of LOVE

Oxytocin- keeps couples together, it is released when there is physical affection, especially through skin contact, hugging, massage and foreplay. It produces strong feelings of intimacy, contentment and trust (Kosfeld, M., Heinrichs, M., Zak, P., Fischbacher, U., & Fehr, E. 2005). Studies have also shown that Oxytocin Selectively Improves Empathic Accuracy (Bartz, J., Zaki, J., Bolger, N., Hollander, E., Ludwig, N., Kolevzon, A., & Ochsner, K. 2010)

Studies have proved that Oxytocin promotes human ethnocentrism (De Dreu, C., Greer, L., Van Kleef, G., Shalvi, S., & Handgraaf, M. 2011)

Oxytocin regulate intergroup conflict through parochial altruism (De Dreu, C., Greer, L., Handgraaf, M., Shalvi, S., Van Kleef, G., Baas, M., Ten Velden, F., Van Dijk, E., & Feith, S. 2010).

Oxytocin does not allow a lover to see fault in other person whom he/she is in love, it is for this reason it is said

that love is blind, also romantic love is a chemically induced form of madness (Carter, 1998, p. 76) Also Oxytocin is best known for keeping us monogamous, or “pair bonded” as the scientists say.

The hormonal changes keep on changing with passage of time, It has been suggested that fathers undergo hormonal changes when he lives beside his pregnant wife and then beside his young children (Brizendine, 2010; Schneider, Fletcher, Shaw, & Renfree, 2010). According to Fisher's (2004) the love starts fading away after four years of relationship.

Chemistry of Hate;The study, by Professor Semir Zeki and John Romaya of the Wellcome Laboratory of Neurobiology at UCL, examined the brain areas that correlate with the sentiment of hate and shows that the ‘hate circuit’ is distinct from those related to emotions such as fear, threat and danger – although it shares a part of the brain associated with aggression. The circuit shares at least two common structures with circuit of romantic love. The activity in hate circuit in response to viewing a hated face is proportional in strength to the declared intensity of hate.

The hate circuit includes parts of the brain called the putamen and the insula, found in the sub-cortex of the organ. The putamen is known to be involved in the perception of contempt and disgust and may also be part of the motor system involved in movement and action. putamen and the insula are also both activated by romantic love.

Large parts of the cerebral cortex associated with judgment and reasoning become de-activated during love, whereas only a small area is deactivated in hate.

Conclusions; love and hate are two sides of same coin, as scientists have shown that mind uses same major portion during two extremes of being in love or being in hate. The love is welcomed by all, but nobody welcomes the feeling of hate, due to this reason chemicals or the chemistry involved in hate is still not well known.

Just like stress hormones which are released during stress. The chemicals associated with love or hate are released on seeing a object according to our pre fixed notions.

REFERENCE

- Acevedo, B. P., & Aron, A. (2009). Does a long-term relationship kill romantic love? *Review of General Psychology*, 13(1), 59-65. doi:10.1037/a0014226 | Acevedo, B. P., Aron, A., Fisher, H., & Brown, L. (2011). Neural correlated of long-term intense romantic love. *Social Cognitive and Affective Neuroscience*, 7(2), 145-159. | Bartz, J., Zaki, J., Bolger, N., Hollander, E., Ludwig, N., Kolevzon, A., & Ochsner, K. (2010). Oxytocin Selectively Improves Empathic Accuracy *Psychological Science*, 21 (10), 1426-1428 DOI:10.1177/0956797610383439 | Brizendine, L. (2010). *The male brain*. New York, NY: Random House.18 *The Qualitative Report* 2013 | Carter, R. (1998). *Mapping the mind*. Berkeley and Los Angeles, CA: University of California, Press. | De Dreu, C., Greer, L., Handgraaf, M., Shalvi, S., Van Kleef, G., Baas, M., Ten Velden, F., Van Dijk, E., & Feith, S. (2010). The Neuropeptide Oxytocin Regulates Parochial Altruism in Intergroup Conflict Among Humans *Science*, 328 (5984), 1408-1411 DOI: 10.1126/science.1189047 | De Dreu, C., Greer, L., Van Kleef, G., Shalvi, S., & Handgraaf, M. (2011). Oxytocin promotes human ethnocentrism *Proceedings of the National Academy of Sciences*, 108 (4), 1262-1266 DOI:10.1073/pnas.1015316108 | Fisher, H. E., (2004). *Why we love: The nature and chemistry of romantic love*. New York, NY: Henry Holt. | Fisher, H. E. (2006). The drive to love. In R. Sternberg & K. Weis (Eds.), *The new psychology of love* (pp. 87–115). New Haven, CT: Yale University Press. | Fisher, H. E., Aron, A., & Brown, L. L. (2006). Romantic love: A mammalian brain system for mate choice. *Philosophical Transactions of the Royal Society*, 361, 2173-2186. doi:10.1098/rstb.2006.1938 Joanni L. Sailor 19 | Fisher, H. E., Aron, A., Mashek, D., Li, H., & Brown, L. L. (2002). Defining the brain systems of lust, romantic attraction, and attachment. *Achieves of Sexual Behavior*, 31(5), 413. | Fisher, H. E., Brown, L. L., Aron, A., Strong, G., & Mashek, D. (2010). Reward, addiction, and emotional regulation systems associated with rejection in love. *Journal of Neurophysiology*, 104, 51–60. | Kross, E., Berman, M. G., Mischel, W., Smith, E. E., & Wager, T. D. (2011). Social rejection shares somatosensory representations with physical pain. *Proceedings of the National Academy of Science*, 108(15), 6270-6275. | Kosfeld, M., Heinrichs, M., Zak, P., Fischbacher, U., & Fehr, E. (2005). Oxytocin increases trust in humans *Nature*, 435 (7042), 673-676 DOI: 10.1038/nature03701 | Ortigue, S., Bianchi-Demicheli, F., Patel, N., Frum, C., & Lewis, J. W. (2010). Neuroimaging of love: fMRI meta-analysis evidence toward new perspective in sexual medicine. *Journal of Sexual Medicine*, 7, 3541-3552. | Schneider, N.Y., Fletcher, T. P., Shaw, G., & Renfree, M. B. (2010). The effect of pregnant and oestrous females on male testosterone and behaviour in the tamar wallaby. *Hormones and Behavior*, 58(3), 378-384. | Schneiderman, I., Zilberstein-Kra, Y., Leckman, J. F., & Feldman, R. (2011). Love alters autonomic reactivity to emotions. *Emotion*, 11(6), 1314-1321. doi:10.1037/a0024090 | Zeki, S. (2007). *The neurobiology of love*. *FEBS Letters*, 581(14), 2575-2579.