

## The Chemistry of Dreams (A-Review)



### Chemistry

**KEYWORDS :** Dreams, Sleep, REM (rapid eye moment), NREM, Hormones

Dr Sanjay Sharma

DAV College Amritsar

#### ABSTRACT

*Human body needs sleep under all circumstances, during sleep all mammals dream. Even People who become blind after birth can see dreams. Those who are blind by birth have dreams equally vivid involving their other senses of sound, smell, touch and emotion. There are certain chemicals which are associated with dreams. To study the chemistry of brain during dreams is a challenging job but still certain theories have been put forth to explain process of dreams. Dreams are sort of sensations or mysterious mental images that occur involuntarily in the mind during sleep. The study of dreams is called oneirology. During dreams activity of brain is very high but body is in the state of temporarily paralysis. About 20 per cent of our sleep time can have dreams, in most of cases awakenings from REM sleep resulted in recall of a dream, as compared with awakenings from NREM sleep.*

The dreams are considered to be connected to day time thoughts [1]. Most of dreams are lost to recall after few minutes [2] or even within seconds [3] after the end of the REM period. Studies performed in certain animals revealed that REM deprivation may lead to hypersexual and hyperaggressive, which has been interpreted as supporting the view that dreaming is linked to basic drives and pleasure-seeking. [4-6]. Studies have shown association of dreams with REM[7], the brain is switched from sleep to wakefulness and back again by two opposed brain circuits, one produces transmitter chemicals that promote sleep, and the other chemicals that inhibit it.

Dreams involve a low-grade type of mental activity, using brain mechanisms much like those used by the drunk and drugged. It is for this reasons we forget dreams in the morning

**Chemical related to sleep and dreams;** We fall asleep through the activation of the neurotransmitter gamma-aminobutyric acid (GABA). Secretion of Acetylcholine responsible for awakening throughout the day does not allow us to sleep. Other chemicals responsible for awakening are Norepinephrine, Serotonin, Histamine, Aspartate, Glutamate, Dopamine

Acetylcholine is found in high levels during REM sleep. Its lowest levels have been found during delta sleep. In evening these chemicals makes us tired and from this time to until before you are going to sleep there is a raise in levels of chemical called Melatonin. Melatonin is called «the hormone of the night. its concentration decreases with light.

Oxytocin a hormone (related to love) affects our social emotions such as anxiety and passion in real life as well as in dreams.

Adenosine Inside exert a major influence on the regulation of non-REM sleep. This regulating effect occurs when an enzyme called adenosine deaminase breaks down, adenosine molecules. Adenosine levels drop as one continues to sleep

Stress hormone adrenocorticotropin (natural alarm clock) enables some people to wake up when they want to, this is related to unconscious anticipation of the stress of waking up.

A study shows that lack of hormone called nor-epinephrine in the cerebral cortex is responsible for forgetting dreams after awakening.

#### Brain during sleep:

Sleep-inducing waves activate the visual-processing parts of the brain, and makes dream visible. The first stream of brainstem waves usually begins about 90 minutes after the onset of sleep, and the fourth or last about 30 minutes before waking up. During REM periods the brain is even more active than it is while awake, but because the muscles are paralyzed, the body lies quietly in bed.

etly in bed.

Our brain experiences four types of electrical brain waves: “delta,” “theta,” “alpha,” and “beta.” together they form the electroencephalography (EEG).

There are certain studies which show that dreams are generated in, or transmitted through particular area of the brain, which is associated with visual processing, emotion and visual memories. The portion of the brain that is related to Long-term memory is not active while sleeping. For the same reason, dreams quickly fade out when we wake up. Normally only the fragments of a dream left in Short-term memory have a possibility to be converted after we wake up.

Study using MRI techniques revealed that vivid, bizarre and emotionally intense dreams (the dreams that people usually remember) are linked to parts of the amygdala and hippocampus. While the amygdala plays a primary role in the processing and memory of emotional reactions, the hippocampus has been implicated in important memory functions, such as the consolidation of information from short-term to long-term memory.

#### Theories of dreaming;

Different theories have been proposed by scientists;

According to Hartmann[8] the purpose of dreaming is to provide the dreamer with an opportunity to deal with their dominant emotional concern.

Kramer[9] and Cartwright et al.[10] Rather closely related functions for dreaming that incorporate problem-solving and affect regulation.

Stickgold et al propose that, “dreams represent the conscious awareness of complex brain systems involved in the reprocessing of emotions and memories during sleep.”[11]

**Sleeping disorders vrs dreams;** Sleepwalking, previously thought on clinical grounds to be associated with dreaming, typically arises out of NREM sleep in the absence of dreaming[12,13]. On the other hand, a relatively recently described disorder called REM behavior disorder occurs in patients with defective muscle paralysis during REM sleep and involves the acting out of dreams[14]. Sedatives, such as barbiturates suppress REM sleep, which can be harmful over a long period.

**Conclusion;** Dreams mainly occur only during REM sleep, but some dreams occur during non-REM sleep phases also. It's possible there may not be a single moment of our sleep when we are actually dreamless. REM dreams are characterized by bizarre plots, but non-REM dreams are repetitive and thought-like, with little imagery. During dreams only part of the brain wakes up

and it seems to be even more active than it is during waking .particularly emotional region of the brain is highly active during dreaming.

While dreaming Part of brain responsible for decisions or volition becomes de-activated, however there are other areas of the brain that deal with rationality remains active, so we don't lose all rational thinking when we dream.

## REFERENCE

1. Aserinsky,E., Kleitman, N(1953), Regularly occurring periods of eye motility, and concomitant phenomena, during sleep. *Science*,118,273–274
- | 2. Dement, W. and Kleitman, N. ,(1957)"The relation of eye movements during sleep to dream activity an objective method for the study of dreaming". *J Exp Psychol*,53,339–346 | 3. Goodenough, D.R.(1978) Dream recall, history and current status of the field. In: Arkin AM, Antrobus JS, Ellman SJ, eds. *The Mind in Sleep*. Psychology and Psychophysiology. Hillsdale, NJ: Lawrence Erlbaum Associates,113–140 | 4. Dement, W., Henry, P. and Cohen, H., et al.(1967)" Studies on the effect of REM deprivation in humans and in animals" In: Kety SS, Everts EV, Williams HL, eds. *Sleep and Altered States of Consciousness*. Baltimore: Williams and Wilkins,456– 468 | 5. Dement, W. (1969)." The biological role of REM sleep" ,In: Kales A, ed. *Sleep: Physiology and Pathology*. Philadelphia, JB Lippincott, 245–265 | 6. Steiner, S.S, Ellman, S.J.(1972)" Relation between REM sleep and intracranial self-stimulation". *Science* ,177,1122–1124 | 7. Snyder, F.(1970)" The phenomenology of dreaming", In: Madow L, Snow LH, eds. *The Psychodynamic Implications of the Physiological Studies on Dreams*. Springfield, IL, Charles C. Thomas, 1970,124–151 | 8. Hartmann, E(1996);" Outline for a theory on the nature and functions of dreaming" *Dreaming*,6,147–170 | 9. Kramer, M. ( 1993) "The selective mood regulatory function of dreaming: an update and revision. In: Moffitt A, Kramer M, Hoffmann R, eds. *The Functions of Dreaming*. Albany, NY, State University of New York Press, 139–195 | 10. Cartwright, R., Luten, A.and Young, M., et al.(1998)" Role of REM sleep and dream affect in overnight mood regulation: a study of normal volunteers". *Psychiatry Res* ,81,1–8 | 11. Stickgold, R., Hobson, J.A.and Fosse R., et al.( 2001)" Sleep, learning, and dreams, off-line memory reprocessing" *Science*,294, 1052–1057 | 12. Gastaut, H.and Broughton, R.,(1965)," A clinical and polygraphic study of episodic phenomena during sleep." Wortis J, ed. *Recent Advances in Biological Psychiatry* Vol. VII,New York, Plenum Press,197–221 | 13. Jacobson, A., Kales, A., Lehmann, D., et al.(1965) "Somnambulism,allnight electroencephalographic studies" *Science*,148,975– 977 | 14. Schenck, C.H., Hurwitz, T.D,and Mahowald, M.W,(1993)" REM sleep behaviour disorder, an update on a series of 96 patients and a review of the world literature". *J Sleep Res*, 2,224– 231 |