Review Article

The Neuro-Endocrine Regulation of Male Libido

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Introduction
Libido [latin] has been defined as “psychic drive or energy that is associated with sexual desire (Oxford dictionary). Although libido is loosely used interchangeably with sexual desire, it is a more complex function that includes generation of the following- (1) spontaneous sexual thoughts and fantasies, (2) attentiveness and responsiveness to erotic stimuli, (3) pleasure seeking behavior.¹

Male sexual response consists of- (1) arousal, (2) erection, (3) ejaculation, (4) orgasm, (5) resolution. Male sexual function is the outcome of conjugation of a no of factors such as, (1) psychogenic, (2) neurological, (3) endocrinological, (4) vascular, (5) cavernosal.

The Neurophysiology of sexual arousal
The word arousal encompasses a behavioral state produced by arousal pathways, electrophysiological mechanisms, and genetic influences. Two basic qualities of the arousal response are protection and performance. Sexual arousal comprises a particular subset of central nervous system arousal functions which depend on primitive, fundamental arousal mechanisms that cause generalized brain activity, but are manifest in a sociosexual context. As a subcategory sexual arousal is dependent on all of the above. In its specificity, has additional dependent factors like (1) Neural (sensation, cognition) factors, (2) Hormonal factors, (3) Genetic factors, (4) Influences of culture and context (human). Without sexual arousal, there is no activation of the cognitive and physiologic processes that lead to sexual behavior. The neural mechanisms for sexual arousal probably operates at different levels(spinal cord, midbrain, hindbrain) individually and in conjugation as described below. Cutaneous pressure on the genital dermatome leads to pressure on Ruffini endings in the skin, and action potentials enter the spinal cord and excite second-order neurons. Somatosensory inputs from the spinal cord ascend through the anterolateral columns.
which are eventually received by the medullary reticular formation (MRF) and the lateral vestibular nucleus (LVN). The efferent signals are carried by the axons from the MRF and the LVN descending through the anterolateral columns to facilitate lordosis central nervous system. The Lumbarspinothalamic (LSt) neurons which are unique to the spinal cord in male are situated dorsolaterally to the central canal at the level of the third and fourth lumbar spinal cord and project to the thalamus. These neurons are sexually dimorphic in the sense that males possess a greater number. These neurons are specifically associated with ejaculation, but not with mounting or intromission. The Lumbarspinothalamic (LSt) neurons which are unique to the spinal cord in male are situated dorsolaterally to the central canal at the level of the third and fourth lumbar spinal cord and project to the thalamus. These neurons are sexually dimorphic in the sense that males possess a greater number. These neurons are specifically associated with ejaculation, but not with mounting or intromission. The endocrinology of sexual arousal: the role of testosterone

Attentiveness to erotic stimuli, spontaneous sexual thoughts and fantasies, and ability to respond to visual erotic stimuli, and optimal arousibility threshold—all these are of paramount importance to generation of libido. The abstract form of libido is translated to a more physical form i.e. erection of phallus (penis in male, clitoris in female) primarily by the influence of the efferent neural signals as described above. Penile tumescence is of basic necessity to have a successful erection. Penile tumescence can be spontaneous (nocturnal) or to erotic stimuli. A more advanced step in the erectile process is rigidity, which is dependent on the patent vascular supply and sustained dilatation of the venous sinuses within the penis. The erectile process culminates in ejaculation which coincide with orgasm in male and is the outcome of coordinated action of neural, vascular and hormonal processes. That the penile erections can occur in hypogonadal men, particularly in response to appropriate erotic stimuli, is testimony to the fact that erection is a primitive reflex and primarily dependent on neural signals and not endocrine. Orgasm and ejaculation are also androgen-independent and can occur in the absence of a full erection. This could explain perverted sexual behavior and fetish. However, testosterone might induce nitric oxide synthase within the cavernosal smooth muscle and might be necessary for achievement of optimal penile rigidity. Even estrogen (E2) has some interesting role to play in male. Estrogen (not testosterone) along with inhibin has negative feedback on H-P-G axis bringing down LH FSH.

Late Onset Hypogonadism (LOH)

It is also referred to as age-associated Testosterone Deficiency Syndrome (TDS). Along with the ageing process, significant changes in the Hypothalamo Pituitary Gonadal axis take place. To start with the pulsatile GnRH secretion is attenuated in older men. Overall the orderly and synchronous manner in which the hormones at different level, i.e. hypothalamus, pituitary and gonad is disrupted.
While on one hand the so called feedforward action of LH (of stimulating testicular androgen secretion is) attenuated, on the other hand the androgen mediated feedback inhibition of pituitary LH secretion becomes more efficient. Greater variability in LH pulse frequency, amplitude, and secretory mass in older male in comparison to their younger counterpart also have been observed. The gradual decline testosterone level in male is depicted in Fig.2.\textsuperscript{1-3,5}

**References**