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Review

The pharmacology of the human female orgasm — Its biological and physiological backgrounds

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ABSTRACT

The female orgasm has been examined over the years by numerous scientific disciplines yet it still has many secrets to be disclosed. Because its physiology, especially its neurophysiology, is sparingly understood its pharmacology is necessarily limited based mainly on the side effects of drugs. Few published studies have used a placebo group as controls. The paucity of focussed studies is well illustrated by the fact that there still is no approved medication to treat female orgasmic dysfunction. The present brief overview examines the most important aspects of its biology and especially its physiology highlighting the many questions that need answering if we are to have a comprehensive pharmacology of the female orgasm.

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1. Introduction

The mechanisms underlying the stages of sexual arousal in the human female – desire, excitement, orgasm and then resolution – have been the objects of study from the viewpoints of numerous disciplines including endocrinology, gynaecology, biochemistry, neurology, evolutionary biology, physiology, psychology, psychiatry and pharmacology (Levin, 2004). The most difficult to study are desire (Levine, 1984; Levin, 2001; Heiman, 2001; Pfaus, 2009) and orgasm (Levin, 2004; Georgiadis, 2011) and with both their pharmacology stand out as being a somewhat barren field. This is mainly due to the fact that definitions rely on describing the observable reported physical changes and that its biology and physiology are surprisingly still often controversial and poorly researched (Levin, 2012). However, to appreciate this, a brief account of the latter is essential to place the very limited pharmacology of the female orgasm into perspective.

Sexual arousal to orgasm in the human female creates changes in the brain and body that underscore both the experience of intense pleasure (recreative sex) and the procreative functions (reproductive sex). The review introduces, in self-contained sections, the structures and their functional involvement in these changes leading to orgasm.

In its simplest definition, orgasm has been described as the climax of sexual arousal, 'the few seconds during which the vasoconcentration and myotonia developed from sexual stimulation are released' (Masters and Johnson, 1966). Such a definition, however, does not convey its objective and subjective complexities as orgasm is a construct with multiple indicators. We do not have the exact underlying brain and spinal cord neural activity that occur. A more comprehensive working definition was developed on these lines thus, 'an orgasm in the human female is a variable, transient peak sensation of intense pleasure creating an altered state of consciousness usually accompanied by involuntary rhythmic contractions of the pelvic striated circumvaginal musculature, often with concomitant uterine and anal contractions and myotonia that resolves the sexually induced vasocongestion (sometimes only partially), usually with an induction of well-being and contentment' (Meston et al., 2004). The structure of the review that follows details, in specific sections, the various activities involved in this working definition of orgasm.

2. The physiology of the female orgasm

2.1. Non-genital features

At orgasm there is a peak of heart rate, blood pressure, and respiration (Masters and Johnson, 1966). The subjective mental experience is normally one of ecstatic pleasure but in some people, anhedonics, the experience can be of little or no pleasure (Qureshi and Levin, 1991). Even in the general population the spectrum of the pleasure experienced can range from just nice to an explosive condition that can even cause transient unconsciousness (Kinsey et al., 1953). The extreme pleasure experienced usually creates a characteristic 'orgasm' face — the mouth is open, eyes are shut and facial muscles create a grimace that leads onlookers to think that the female is suffering from extreme pain (Masters and Johnson, 1966; Fernández-Dois et al., 2011).

Orgasm does not require consciousness as it can occur during sleep (Wells, 1983) nor does it necessarily require consensual sexual arousal (Levin and van Berlo, 2004). Unlike men, women can experience multiple serial orgasms and unlike the saying that 'nothing is as good as the first time', subsequent orgasms after their first can often be of greater pleasure (Masters and Johnson, 1966; Levin, 2009). Written descriptions of the pleasure of orgasm by men and women with any reference to their gender or specific genitals removed were not able to be identified as being those from males or females by a judging panel of men and women suggesting that these subjective feelings are similar if not identical in both sexes (Vance and Wagner, 1976). Orgasm, or at least its overt behavioural signs such as sexual vocalisations, sensuous pelvic movements and even vaginal lubrication can be induced by hypnosis (see Levin, 1992 for references). Indeed, on the internet, numerous video clips of multiple orgasms in females purportedly induced hypnotically are plentiful but unfortunately no critical laboratory studies or measurements have yet been undertaken.

Despite Masters and Johnson (1966) observing many thousands of orgasms in the laboratory, surprisingly, they did not record their duration objectively. The only study that has recorded both the objective and subjective durations of the female orgasm in the laboratory is that of Levin and Wagner (1985). The objective duration, from the moment the subjects said it started to when they said it finished, was 19.9 ± 12 s (mean ± standard deviation in 26 subjects) while the subjective duration, how long the subjects thought it lasted for, was significantly lower at 12.2 ± 9.8 s (in 14 subjects). The objective duration was not correlated with the subjective pleasure grading by the subjects of their orgasms.

3. Muscular contractions

3.1. Contractions of the pelvic musculature

The pelvic floor musculature in women has a complex structure consisting of a number of powerful striated muscles that surround and support the internal female pelvic organs and genitalia. Surprisingly, the actual description and the terminology of the muscles in the literature are plagued with disagreement (Barber, 2005; Messelink et al., 2005; van Houten, 2006). One description of them (see Van Houten, 2006) includes those of the pelvic floor — the levator ani (pubococcygeus, iliococcygeus, puborectalis), coccygeus, pyriformis, obturator and perineal muscles (ischiocavernosus, bulbocavernosus, superficial and deep transverse perineal, sphincter urethrae). They have a resting tone (the degree of contraction maintained by slow twitch (type 1) efferent fibres) which can become over or underactive.

Both conditions create sexual dysfunctional states and can inhibit the pleasure obtained at orgasm during their contractions (pleasure dissociative orgasm disorder — PDOD Wylie and Levin, 2013). In most women pulsatile musculature contractions of the pelvic floor at and during orgasm are concomitant with each wave of pleasure and often non-verbal vocalisations accompany the contractions (Levin, 2006a). Even when trying, it is not possible to mimic consciously the exact repetitive firing pattern of contractions. Sherfey (1966) postulated that the cause of orgasm was a spinal reflex triggered by the firing of the stretch receptors in the pelvic musculature, the 'vasocongestive distention' causing them to contract repetitively. Mould (1980) suggested that the vasocongestion caused biassing of their gamma fusimotor muscle spindles and that this finally caused a dynamic stretch reflex. The concepts have not been investigated further and have been overlooked in the literature, but see Section 8 which discusses a 'cusp' or tipping point to initiate orgasm.

It is not understood how the contractions and the orgasmic pleasure are connected for just contracting the muscles voluntarily does not itself create such pleasure. However, according to the recent brain imaging by a PET study of Huynh et al. (2013) the pelvic muscles are represented by two sites in the pontine tegmentum area. The ventrolateral (right) side was only activated by orgasm per se while that on the dorsolateral (left) side was activated during orgasm but was also activated in those women who attempted but failed to have an orgasm and in women who imitated (faked) orgasm. The authors proposed that the dorsolateral site was activated during orgasm and during micturition and was named the 'pelvic organ stimulating centre' while the ventrolateral site was named the 'pelvic floor stimulating centre' and was only activated during orgasm with direct connections to the pelvic floor musculature. Hence, it appears that the latter site is the one specifically involved in orgasm. Even the exact function(s) of the sexual pelvic floor muscle contractions are problematic. Levin (2011a) listed a number that have been suggested (with the addition of brief criticisms of each proposal in parentheses) which included ejecting