Reproductive Behavior

by Richard H. Hall, 1998

Male Hormones and Sexual Behavior

Sexual behavior is impossible to study via the experimental method in humans, for obvious reasons, and, for that reason, much of what we know about sexual behavior comes from research with rats. What evidence there is indicates that this research generalizes fairly well to humans, sort of. More specifically, as we'll see, the sexual behavior of the human male seems to have a biological basis similar to that of the rat, but the same does not appear to be the case with the human female. The biological basis of sexual behavior with human females is much more illusive.

Let's begin by considering the role of hormones in the sexual behavior of the male rat. First, there's a great deal of evidence that male rats are responsive to females whose estrogen levels are high. This occurs when the female rats are in heat. Researchers have found that rats respond sexually to a female with high estrogen levels, they will not respond to females with the ovaries removed (and, thus, unable to produce estrogen), and females injected with estrogen, whether they are in heat or not, appear "attractive" to male rats. Male rats are sensitive to female estrogen levels via a secondary olfactory system that is responsive to chemical messengers called "pheromones". It has long been known that animals are sensitive to these chemicals, but, whether or not humans are responsive to pheromones, is an intense topic of debate among neuroscientists today. In addition to being responsive to female rats with high estrogen levels, the male hormone testosterone also has a strong sex initiation effect in male rats. For example, removal of the testes (which produce testosterone) in male rats decreases and eventually eliminates sexual behavior.

With respect to male humans, testosterone also appears to play a big role. Sexual disorders effecting sexual drive and performance are often associated with low testosterone levels, and, conversely, are often treated successfully with drugs that increase testosterone levels. Further, castration, carried out for medical problems, usually has a dramatic (though often gradual) effect on sexual behavior in human males. This does, however, appear to be partly related to learning in that, castration before adolescence, usually eliminates sex drive from ever occurring. On the other hand, the rate of decline in sexual behavior for males castrated after adolescence appears to be related to their sexual experience, with the rate of decline more gradual for those with more experience.

Female Hormones and Sexual Behavior

The most important hormone in the reproductive behavior of female rats is estrogen. Estrogen levels vary directly with the female rat’s estrus cycle, and are highest when the female rat is "in heat". A female rat will only approach a male when she is in heat, and the removal of the ovaries will eliminate sexual behavior. Further, the effect of the removal of the ovaries can be reversed with estrogen injections.

For human females, on the other hand, the evidence for a link between sexual behavior and hormones is not as strong. For example, with human females an ovariectomy often has little

effect on sexual behavior, and researchers have failed to consistently find a relationship between menstrual cycles and sexual behavior.

The Brain and Sexual Behavior

The **medial preoptic area (MPA)** of the brain, which is just above the hypothalamus, appears to be the central brain structure in controlling sexual behavior for rats. Stimulation of the medial preoptic area increases sexual behavior, and lesioning this area eliminates it in male rats, but does not affect the sexual behavior of female rats. Further, this area contains testosterone receptors. So, it is likely that this is the area of the brain where testosterone has its initiating effect. This may well be the case with human males too, in that autopsies indicate that males have larger medial preoptic, with more cells, than females. The link between sexual behavior and this brain area in humans is further supported by evidence that indicates that an area of the hypothalamus (the interstitial nucleus of the anterior hypothalamus — INAN3) is larger and more developed in heterosexual males than in homosexual males and heterosexual females (LeVay, 1991).

With rat females, the **ventral medial hypothalamic nucleus (VMH)** appears to play a similar role in their sexual behavior. As with the MPA in males, lesioning the VMH eliminates sexual behavior, stimulating it increases sexual behavior, and this area is rich in estrogen receptors. On the other hand, with human females, once again the link between brain areas and sexual behavior has not been established. There is not evidence, direct or indirect, that the VMH plays any role in the sexual behavior of human females.

When we consider the lack of evidence in support of a direct relationship between brain structures and hormones in their effect on sexual behavior in human females, it's not too surprising, in light of what psychologists already know about differences in the sexual responses of males and females. A few decades ago Masters and Johnson, pioneers in the field of sexual behavior, found that the sexual response cycle for human females was much more complex and varied than that of human males (Masters & Johnson, 1966). So, in some sense, the fact that there does not seem to be a simple connection between underlying physiological factors and sexual behavior in human females, as compared to males, is just one more piece of evidence that underlying physiology is a reflection of behavior.

References

- LeVay, S. (1991). A difference in hypothalamic structure between heterosexual and homosexual men. *Science*, *253*, 1034 — 1037.
- Masters, W. & Johnson, V. (1966). *Human sexual response*. Lippincott-Ravin.