The Two Become One: The Role of Oxytocin and Vasopression

And the Two Shall Become One

...A study of the human biochemistry associated with sexual intercourse suggests there is nothing casual about human sexuality.

The delicate biochemistry of the human person seems to be designed and ordered to respond to intercourse by forming exclusive, intimate, stable pair-bonds that favor permanency...

Though marital unity and indissolubility may perhaps seem ideal but unrealistic and even unappealing to contemporary culture, scientific research is beginning to uncover that the physiology of the person may actually be ordered to it.

Sexual intercourse appears to be a threshold at which man and woman enter into a new relationship that is biochemically oriented toward staying together, geared toward their unity as a couple.

Animals often serve as models for human beings in scientific research, especially in the testing of medicines and experimental medical procedures. For example, as a mammal, the mouse can be compared in numerous respects to humans and is therefore routinely used in laboratories.

The same holds true for the modeling of some aspects of human behavior, though there are some very significant differences which must be acknowledged at the outset.

Unlike animals, man possesses free will. Thus, while animal behavior generally follows immediately from interior biochemical signals, in man the process is far more complex.

Human behavior is not only influenced by our biochemistry, but our biochemistry can be also directly influenced by our freely chosen behaviors.

With this in mind, we can learn something significant about sex and monogamy by turning to the animal world.

Biochemistry and Pair-Bonding

Chemicals released during intercourse, such as oxytocin and vasopressin, introduce a unique effect that promotes a series of pair-bonding behaviors.4

The primary exposure of the system to these chemicals seems to trigger a response that permanently alters body chemistry, and consequently behavior tendencies, making the individual (animal or human) more receptive toward his or her partner.5

Once the bonds are established, the disruption of these bonds causes great distress.6

It is clear that the body favors the maintenance of these bonds and reacts unfavorably when they are broken. Such data seem to show that the biochemistry of the body associated with sexual union is optimally designed to be experienced within the context of an intimate and permanent relationship.

The information supporting this claim stems from research done on the prairie vole (Microtus ochrogaster), a small rodent that lives in the grasses of the Midwest. Scientists discovered that the prairie vole displayed monogamous behavior, whereas its relative, the montane vole (Microtus montanus), showed patterns of non-monogamous behavior.7

The prairie vole showed partner-preference, selective aggression toward unfamiliar members of the same sex, and biparental care of the young, all typical indications of monogamy. The montane vole, however, showed classic non-monogamous behaviors, such as no partner-preference, little aggression toward other prospective mates for past partners, and care of the young left to the female.8

Oxytocin, a hormone produced in mammalian brains, was already known to promote bonding in some species between males and females, as well as between mothers and offspring. Scientists in this area of research wondered, then, if oxytocin might play a role in the affiliative behaviors of the prairie vole.

Other researchers discovered that oxytocin plays a critical role in pair-bond formation in both sexes of monogamous mammals. The female prairie vole, noted for her cuddling and affectionate grooming tendencies toward her chosen mate, when given an extra dose of oxytocin, increased her affections and stuck even tighter with her partner.

Conversely, when an inhibitor to oxytocin was introduced to her system, she left her partner for others, ceasing to display a preference at all.

The oxytocin antagonist prevented pair bonding, though it did not interfere with mating.9

In males, vasopressin was found to play the key role in pair-bonding. When additional vasopressin was administered to male prairie voles, their normal behavior of mate guarding was amplified into aggressive snarling behavior to other passerby males. However, when vasopressin antagonists were introduced, the protective male casually stepped aside, allowing other males the opportunity to mate with his partner.10

In addition to selective aggression, vasopressin has also been shown to be active in the social recognition of mate and pups, important in monogamy.11 The stark contrast in behavior patterns between the two species of voles left scientists wondering what accounted for the difference. It was concluded that the neuro-peptides oxytocin and vasopressin must be utilized differently in the prairie and montane voles since the hormones were present in each animal, yet showed such pronounced effects toward monogamy only in the prairie vole.

Some researchers then turned their attention to the location of brain receptors for these neurotransmitters, hoping that this would provide some answers. Oxytocin receptors were found in high concentrations in the nucleus accumbens and the prelimbic cortex in prairie voles.12

These regions of the brain participate in the mesolimbic dopamine pathway, which functions in a pattern of reinforcement and behavior reward.

This means that the release of oxytocin stimulates the nucleus accumbens, which then triggers the reward pathway that allows for conditioning and learning. It is this pathway that is activated by the release of oxytocin after mating, which then promotes mate recognition through this reinforcement pattern. Montane voles did not prove to have the same receptor distribution pattern at all, exhibiting a sparse number of receptors in the nucleus accumbens. Not enough receptors are located there to actually stimulate the mesolimbic dopamine pathway, and as a result, partner recognition is not learned.13

Vasopressin receptors were found in large numbers in the ventral forebrain of the prairie vole in the ventral pallidum.14 This area of the brain is likewise associated with the reward pathway and contributes to the male's ability to recognize his partner. Again, the montane vole did not show a high density of these receptors in that area, and thus when vasopressin is released in these voles, it is not able to stimulate the ventral pallidum to trigger the system for partner recognition, and bonding does not occur.15

This distinction between the two different patterns of receptor distribution within the brain enables researchers to identify monogamous and non-monogamous species.16

Vasopressin is specifically linked to pair-bonding in prairie vole males after its release during intercourse. Studies have established that there is a rapid development of both selective aggression and partner preference formation following mating. These are two critical functions in monogamous pair bonding in that they help maintain the boundaries of exclusivity for the couple.17

Vasopressin plays an important role in prompting a desire of the male to stay with his partner rather than roaming to find another. Additionally, it has been shown that vasopressin contributes to whether or not males participate in rearing offspring.18

Other studies have
demonstrated the value of this neuropeptide in social recognition, while it had no effect on object recognition. This is an important factor in paternal investment and bonding, since it produces biochemical links between the male and his offspring.19

Essentially, vasopressin released after intercourse is significant in that it creates a desire in the male to stay with his mate, inspires a protective sense (in humans, perhaps this is what creates almost a jealous tendency) about his mate, and drives him to protect his territory and his offspring. The value of such tendencies toward the maintenance of marriage and family can easily be anticipated.

Because the receptor distribution patterns in humans are similar to those of prairie voles, researchers hope that studies done on prairie voles might provide insight into human social behavior patterns as well.

The literature has shown that oxytocin is released in large quantities during childbirth (to aid in the contractions of the uterus) and in the milk let-down response of nursing, both critical bonding moments in nature between the individual mother and child.20

Recent studies have focused on oxytocin that is released during sexual arousal and intercourse and its effect on social bonding.21

Sexual climax has been found to trigger an enormous release of oxytocin.

Such a release occurs in both the man and woman and is thought to be associated with contributing to the pleasure sensation during intercourse, and to intense emotional pair-bonding.22

The studies involving the prairie vole also showed that after mating, oxytocin played a particular role in females in inducing cuddling and affiliative behaviors.23

Such effects in women have long been noted through human experience as well. Scientists point to oxytocin's partnership with estrogen as an explanation of the heightened susceptibility of women to its effects of intense bonding and also to the evidence of significant distress when bonds are broken.24

Love and Lust

The more researchers learn about the neuropeptides oxytocin and vasopressin, the more undeniable it becomes that the human body is oriented toward forming lasting and intimate bonds with the sexual partner.

Research also shows that the human brain has both love and lust circuits.25

Notably, attachment behavior that triggers the love circuitry actually promotes physical health, well-being, and positive psychological effects.26 Such behavior includes acts that protect the tenderness, exclusivity, and permanency of the relationship. A loving marital union exemplifies such behavior in that it provides a stable, permanent context for intimacy.

Conversely, behavior that triggers the lust pathway results in physiological effects that are grating on the physical, emotional, and psychological dimensions of the person.27 Such behavior includes actions that merely are in response to stimuli, such as attraction or desire, but are outside the context of an exclusive and intimate pair-bond.

This type of behavior can lead to desertion or lack of emotional engagement between partners. Premarital sex and cohabitation are two examples of behavior that sociologists and psychologists have shown produce negative long-term feelings and psychological responses.28

It makes sense, in light of the biochemistry of bonding that comes through sexual intimacy, that the lack of constancy, commitment, and regard for the partner is internalized, and results in increased experiences of depression, dissatisfaction, and the disruption of future bonding potential.29

Such a discrepancy in the response of the person to the two different options—love and lust—indicates that it is in the subject's best interest naturally to choose behavior that is truly loving and respectful of the dignity that each person deserves...

Even the biochemistry of the human person indicates that when a couple reaches the point of ultimate physical communion in sexual intercourse, the union is apt for permanence and monogamy...

Animal bodies engage in action driven by instinct and reaction rather than choosing their actions.

The human subject's body, however,
responds to the freely determined will of the person and acts according to its interior motivations and decisions.

The physical body then
responds in an objective way, but it is the choosing that separates animals and humans in this respect.

Additionally, the nuptial meaning of the body expresses love, a unique ability of the body of personal subjects, which humans are. As the interior person desires to make a gift of oneself in love to another, the body is able to manifest such a gift externally.

This is a key difference between animals and persons, in that animals come together by drive alone, whereas persons experience a desire for the other and have the cognitive ability to make a choice to enter into relations with the other or not. If they choose to enter into relations, the choice is freely determined.

While history has witnessed various times of differing acceptability for sexual norms, by and large there has been a general default toward placing sexual intercourse in the context of marriage as a means for a couple to bear a family and express intimacy.

Today, however, with the advancement of technology and relaxed social factors, no such default seems necessary, and sex has become common among teenagers, among unmarried adults, and among those having extra-marital affairs.

These "relationships" in our society are portrayed as anything from expressions of progressing love and intimacy to casual recreation.

Historically, social consequences of having intercourse out of the context of marriage led to embarrassing out-of-wedlock births, the ruin of social reputation—especially among unmarried girls—and a general sense of shame that was shared by the perpetrators and their families. However, at this moment in history, the factors that surround the issue are geared toward minimizing the negative consequences of sex outside of marriage.

Technological advancements have allowed for a great separation of fertility from intercourse, allowing intercourse to be conveniently sterile for those who would prefer not to have to consider the possibility of raising a family with their bed partner.

Certain feminists and other ideologically driven groups rally for sexual permissiveness and promiscuity to be more acceptable, claiming it to be more natural to avoid such socially constructed and oppressive institutions as marriage.

As long as the world turns, there will probably be an ongoing debate about the purpose and meaning of sex, but as far as human biochemistry is concerned, it has spoken—and it favors unity and indissolubility.

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Notes

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