

Dopamine blockers lead faithful voles astray

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By Gaia Vince

The secret to everlasting love may lie in a specific region of the brain activated by the brain chemical dopamine, say researchers studying prairie voles. The rodents usually form lifelong monogamous pair-bonds with their mating partners, but the researchers found that by manipulating certain dopamine receptors in specific regions of their brains, they could disrupt these relationships and even cause them to become unfaithful.

Brandon Aragona at Florida State University in Tallahassee, US, and colleagues examined the "love affair" that develops between prairie voles. After mating once, the male prairie vole not only prefers the company of his mate, but will act aggressively towards other available females. His female partner displays a similar commitment, showing hostility towards other interested male voles.

The researchers found that, after a single mating encounter, large amounts of the neurotransmitter dopamine are released into the nucleus accumbens, a sub-cortical region of the brain that is also involved in motivated behaviour and the development of addiction.

"Dopamine release is associated with a reorganisation of brain circuitry that changes this region of the brain, promoting pair-bonding," Aragona explains.

Injected attraction

He investigated the role played by two dopamine receptors (D-1 and D-2) on pair bonding by injecting chemicals into the voles' nucleus accumbens that either activated or blocked the receptor. Aragona's team discovered the D-2 receptors are activated during the first mating encounter, which results in pair-bond formation. After extended cohabitation with the female, however, there was a significant increase in stimulation of D-1 receptors, which led to aggressive behaviour towards other females. Blocking D-1 at this point prevented the aggression.

The researchers also found that a virgin male adult injected with a D-2 activating chemical formed an instant and lasting pair bond with the nearest female, even if she were not sexually active and no mating took place. The injection also triggered aggressive behaviour towards other females, even ones that offered sex. D-1 activation in virgin males, conversely, prevented them from committing to a female in the first place.

In addition, when a male from a long term cohabitating relationship was injected with a D-1 blocker, he suddenly stopped acting aggressively towards other females and began playing the field.

"Thorough parents"

"This strong pair-bonding has evolved as a protective mechanism – voles are small and vulnerable to predators such as snakes or birds. The most protective situation is for the pups to be looked after in a two-parent family," Aragona says. "Prairie voles are extremely social animals, they live together in large family groups and both females and males are extremely good and thorough parents."

The answer to one of life's most pressing questions – how to make a lover commit? – may therefore come down to correctly triggering their dopamine receptors. "Our study shows that love is in the brain, not the heart," confirms Aragona.

Interfering with dopamine receptors through drug use may also result in unwanted side effects. "Recreational drugs such as cocaine can cause this area of the brain to be reorganised so that it doesn't respond correctly to normal signals," Aragona notes. "It is no surprise that people in long-term, stable relationships are less likely to become addicted to drugs."

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