A study of monogamous mammals shows having a romantic partner changes your brain chemistry

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LOVE VOLE-HEARTEDLY

Bonded for life. (Zack Johnson/Emory University)

Voles, an adorable cousin of mice and capybaras, are important to scientists because they share a rare behavioral trait with humans: like us, they tend to mate monogamously for life.

Since it'd be way too invasive to look closely at human brains to try to learn why we couple up from a biological standpoint, researchers are instead digging into the minds of these little rodents.

In a study published (paywall) today (May 31) in Nature, researchers from Emory University found that mating for life—which scientists call "pair bonding"—not only changes the brain chemistry in voles, but that this change may, in turn, affect the way they treat their partners.

The study focused on female voles' interactions with male partners. The team of scientists inserted electrodes into the front of the brains of female

voles to look at each ones' individual neuron activity as they interacted with males. The researchers were looking specifically in the prefrontal cortex, thought to control decision making, and the nucleus accumbens, an integral part of the brain's reward system—previous work suggested both of these play a role in bonding behavior. As the voles mated and huddled next to their partners (which is indicative of pair bonding), their prefrontal-cortex neurons sent oscillating signals to the reward center—effectively teaching the brain to enjoy the partner's presence.

The researchers then tested whether these signals could predict devoted behavior within vole couples. They injected the same female voles with a harmless virus that could activate genes to trigger this same pattern of brain-cell activity in the presence of light—a technique called optogenetics. When scientists flipped the switch, voles that were previously more indifferent to their partners would snuggle up to them affectionately. This, the scientists say, shows that this specific brain activity actually causes female voles to canoodle with their partners.

"Pair bonding in voles is not exactly the same as love in humans," says Robert Liu, a neuroscientist at Emory University and lead author of the paper. "But we believe that pair bonding in voles likely shares many of the underlying neural mechanisms as falling in love in humans."

Brain scan studies show that the same brain regions active in pair-bonded voles become activated when humans look at images of their romantic partners (paywall) and children (pdf). There may even be similar hormones at work with social bonds in both voles (paywall) and humans. Although humans experience much more complicated social dynamics with each other than voles do, voles can provide the basic framework for how relationships can shape the brain.

Understanding the neurological basis of love and other kinds of social attachment, like friendship, could help researchers come up with therapies for people who have a harder time making interpersonal connections. "We

are not doing these studies to uncover the secrets of love, or to make people fall in love," Liu says. Ultimately, the goal is to develop better treatment for people with social disorders like autism, schizophrenia, or sociopathy.