WHAT HAPPENS WHEN YOU FALL IN LOVE? RESEARCHERS SEE BRAIN CHANGES IN SMITTEN PRAIRIE VOLES

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Prairie voles are one of the few mammal species that mates for life. They are socially monogamous and form lifelong bonds with their partners, making nests and raising pups together and showing high levels of affection to one another.

For this reason, scientists often use them to study monogamous behavior and social bonding. Now, a team of researchers from Emory University in Atlanta, Georgia, has found the precise neural circuits involved in the "pair bonding"—or falling in love—process. Effectively, the scientists were able to watch what was happening in the brains as two voles became life partners.

Their study, published in the journal *Nature*, builds on previous research into the neurological basis for monogamy, potentially providing an insight into human disorders where forming social bonds is difficult, such as autism.

Corresponding author Robert Liu tells *Newsweek*: "Ultimately, everything we do is the result of some brain activity. Prairie voles don't fall in love in the same way humans do, but they do form these pair bonds that are lifelong. In a funny kind of way we're watching what the brain is doing as this is happening. We don't think this is the only part of the brain involved. But we do think it's a key part. We're watching how the brain changes when the partner becomes attractive."

In the study, scientists monitored female prairie voles as they were introduced to a potential mate. They recorded their pre-bonding behavior and the level of activity in specific areas of the brain related to reward. By doing this, they were able to identify the circuits involved in prairie vole pair bonding.

Prairie voles mate for life, making them ideal to study monogamy and social bonding behaviors.

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They also showed that the stronger the level of activity in these circuits, the faster the prairie voles started showing signs they had bonded. This included mating and huddling, where they snuggled up to one another. The researchers were also able to activate this circuit using optogenetics—using light to activate parts of the brain. By doing this, they were able to influence a female's' partner preference.

“This is a brain area we think reflects how rewarding something is. By seeing how their social interactions increase the activity of the circuit, it’s actually telling us, how much will this animal find their soon-to-be partner attractive and want to huddle more quickly with them?” Liu says.

“It was a surprise to us that there was such a nice correlation between the strength of the [brain] activity during these [pre-bonding] behaviors and how quickly they would start to huddle,” he adds.

He says studying prairie voles will allow scientists to get a better insight into monogamy and social bonding: “Prairie voles are wonderful as a model system to do this. It’s not something we could do in humans because again we want to actually see what’s changing as the bond is formed. We’d have to have some sort of way to watch over time what’s going on. That would be really hard to do in humans.”

Previously, scientists have shown activity in this region of the brain occurs when men and women are shown images of their partner: “But that’s after a bond has already formed,” Liu says. “What we’re doing with the prairie voles is to try to understand how that comes about by looking at the changes, in particular the circuits that can drive this part of the brain, the reward part of the brain, during the formation of the brain.

“Ultimately, down the line what we’re learning here are about the processes that enable social bonds to be formed and what we hope is that this knowledge can tell us what might go wrong in individuals who have more difficulty with social function, for example in autism or schizophrenia.”

Prairie voles huddling. Scientists have seen the neural circuits involved in "falling in love."

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Mohamed Kabbaj, professor of biomedical sciences and neurosciences at Florida State University, who was not involved in the study but also studies social bonding in prairie voles, tells *Newsweek* in an email: "While our knowledge of the molecular factors implicated in the formation of social attachment has increased in the past decades, it remains unknown how neuronal activity in the brain is involved in this process.

"These observations [in this study] are of particular interest as they represent the first data on neuronal connectivity between two highly relevant brain structures during socio-sexual interactions, and thus represent the first piece of information on how neuronal activity within the brain is altered, in real-time, during the formation of a social bond."

The study is particularly significant, he says, because it provides the first evidence that social interactions cause changes to the neurological connections in the brain's reward circuit, and that this controls how social bonds are formed.