

Changing stress levels can make brain flip from 'desire' to 'dread'

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A single brain circuit mediates desire and dread according to a new study by the University of Michigan. Entering a noisy, new environment can instantly flip an emotion switch.

“We experience desire and fear as psychological opposites. But from the brain’s point of view they seem to share a common kernel that can be flexibly used for either one,” said Kent Berridge, a U-M psychology professor who oversees U-M’s Affective Neuroscience & Biopsychology Lab. “This brain limbic circuit can retune its emotional functions from moment to moment, according to situation.

“In some human disorders, this brain circuit might be more permanently retuned by pathology that unbalances the flexible circuit. For example, this same circuit might produce persistent desires in addiction, but fearful emotions in schizophrenia or phobias.”

The study is featured in the April issue of the journal *Nature Neuroscience*.

The nucleus accumbens is a brain structure mediating pleasure and desire for rewards that also participates in feelings of fear. U-M psychology researchers found the same group of neurons can flip back and forth, generating either a strong desire for food or an intense fear, depending on the mood of the situation when the neurons are activated.

U-M psychology researchers Sheila Reynolds and Berridge used a

painless microinjection technique to put a tiny droplet of a drug (DNQX) into about a cubic millimeter of a rat's nucleus accumbens (in the front base of the brain) that was processing signals from the cortex.

The droplet chemically tapped a key on a limbic keyboard to generate either a positive desire to consume reward or a negative fear, depending on its exact location in nucleus accumbens.

If the tap was placed at the front of the brain structure, a positive desire for food and drink was generated, and the rats ate over eight times their normal amount of food. In the back of the structure, a negative fearful emotion was generated, and the rats displayed fearful behaviors that they would otherwise show naturally only to a threat such as a predator snake or a scorpion.

Researchers found emotions produced by keys in the middle could be retuned by varying the mood of the situation. They administered the same droplets of drug in either the comfortable environment of the rat's own home or in a more stressful laboratory environment that included bright lights and loud punk rock music performed by one-time U-M student Iggy Pop.

Normally, the rats would rather be at home than in the bright lights and music.

In the new environments, many keys of the nucleus accumbens keyboard flipped the emotions they generated. When given in the comfortable home situation, the drug droplets generated only positive desires in nearly the entire nucleus accumbens.

But in the stressfully loud and bright situation, most of the structure generated intense fear in response to the same droplet.

The findings indicate that the same brain circuit can flip emotional modes to cause either desire or fear.

Source: University of Michigan

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