Researchers demonstrate rare animal model for studying depression

October 24 2011

Washington State University researchers have taken a promising step toward creating an animal model for decoding the specific brain circuits involved in depression. By electrically stimulating a brain region central to an animal's primary emotions, graduate student Jason Wright and his advisor Jaak Panksepp saw rats exhibit a variety of behaviors associated with a depressed, negative mood, or affect.

"We might now have a model that allows us to actually know where to look in the brain for changes relevant to depression," says Wright, "and we can monitor how activity in these regions changes as good and bad moods come and go. There are no other models out there like this."

The researchers caution that their work comes with a variety of caveats and that there are still many factors that need to be evaluated.

But while rats aren't humans and can't talk about their emotions, researchers like Panksepp have demonstrated in the past that their emotional behaviors can be valid indicators of their moods. The researchers also believe a focus on specific emotional circuits, shared by all mammals, is an improvement over less specific stressors.

"No one has previously stimulated a specific brain system and produced a depressive cascade," says Panksepp, who has pioneered work in how core emotions stem from deep, ancient parts of the brain. "That is what this paper does."

Their research, published in this month's issue of the journal *Neuroscience & Biobehavioral Reviews*, opens up new avenues of experimentation and treatments by offering a model in which scientists can directly create positive and negative affects with the dependent and independent variables that science relies on.

And with the pandemic of depression in Western society, the researchers say there is a real need for more specific tests focusing on depression-linked emotion networks in a highly controlled fashion.

For now, they say, the lack of animal models aimed at the core emotional issues of depression might be why little progress has been made in antidepressant medicinal development. They note that no conceptually novel drug treatments of depression have emerged since the accidental discovery in the 1960s that increasing brain neurotransmitters like norepinephrine and serotonin can alleviate some depressive symptoms.

Wright and Panksepp focused on a region called the dorsal periaqueductal gray, an area of gray matter in the midbrain that controls perceptions of pain, the fight-or-flight response and emotions of grief, panic and social loss. For 15 days, the researchers administered brief electrical stimuli to the region for a total of 30 seconds over a period of 10 minutes each day. For up to a month afterwards, they documented dramatic reductions in ultrasonic sounds that indicate a positive affective state.

Earlier work by Panksepp's group has demonstrated that the squeal-like ultrasonic sounds reflect a primordial form of social joy comparable -- and perhaps evolutionarily linked -- to human laughter.

The rats also exhibited higher levels of agitation, drank less sugar water and explored their surroundings less -- further indications of a depressed

state.

Wright and Panksepp say they hope this kind of controlled, network-focused work opens a potential new era in the development of psychiatric models.

"In this way," they write, "we may be able to more precisely identify the types of brain systems that lead to various forms of depressive despair and sift through their neurochemical underpinnings for the most promising brain chemicals and vectors for new medicinal development."

Provided by Washington State University