Qualia

Study: Whisker movements in rats shape brain development

November 12, 2012 | Author:AAAS member -- Freelance Writer Mary Bates, Ph.D.

Rat's whiskers are important sources of information about the world around them. (Image: Marshall on Wikipedia)

Rats have incredibly sensitive whiskers, which they move in a coordinated fashion — a behavior known as whisking — to explore their surroundings. Now, researchers from the University of Iowa have published the first report of spontaneous whisker twitching in newborn rats. It sounds adorable, but the finding also helps us understand how such involuntary movements contribute to the development of sensorimotor systems.

When we sleep, parts of our bodies twitch spontaneously, like our eyes (as in rapid eye movement, or REM, sleep) and our limbs. This spontaneous motor activity is especially important in infants, where it drives brain activity and is thought to play a role in shaping neural circuits.

And the same applies to baby rats. The whiskers of newborn rats twitch in their sleep, in a rodent equivalent of rapid eye movements. In the new study, researchers recorded high-speed video of three- to six- day-old rat pups as they cycled between sleep and wakefulness. During active (or REM) sleep, the little rats' whiskers not only twitched, they twitched very rapidly and in sophisticated ways. The researchers observed "independent twitches of single whiskers, simultaneous twitches of adjacent or nonadjacent whiskers, and complex movements comprising various subsets of whiskers moving in variable directions." All this complex movement occurred long before the rats were able to purposefully whisk while awake.

What's more, the sleeping whisker twitches triggered bursts of activity in specific areas of the brain. Those neurons were rarely active in the same manner when the rat pups were awake.

A rat's whiskers are as important to it as your eyes are to you. The rodent whisker system is highly precise as well as sensitive. Each whisker sends information to a discrete region of the brain responsible for processing information from that individual whisker alone. This creates what's known as a somatotopic map in the brain, a neural representation of the physical arrangement of the whiskers on the rat's snout.

This precise organization has made the rat's whisker system a popular model among scientists seeking to better understand how we develop crucial connections between the body and the brain. Just like baby rats, human infants are also faced with the very important task of linking peripheral sensors in the body to the brain regions that interpret and organize sensory information. The discovery of rapid whisker movements in sleeping rat pups further illustrates the hard work that infants of all species are doing, even as they nap.

Related Links:

"Rapid whisker movements in sleeping newborn rats" in *Current Biology*