Rats' and bats' brains work differently on the move

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Flying animals, like this big brown bat in Prof. Cynthia Moss' laboratory, may navigate differently than ground-dwelling rodents. Comparative studies are needed as neuroscientists develop models of how the brain processes spatial information, Moss says. Credit: Jessica Nelson

A new study of brain rhythms in bats and rats challenges a widely used model - based on studies in rodents - of how animals navigate their environment. To get a clearer picture of the processes at work in the mammal brain during spatial navigation, neuroscientists must closely study a broad range of animals, say the two University of Maryland College Park scientists involved in the study.

In the April 19, 2013 issue of *Science*, the University of Maryland researchers and two colleagues at Boston University reported significant differences between rats' and bats' brain rhythms in a part of the brain used in navigation.

The researchers focused on specialized cells that process spatial information in a region called the medial entorhinal cortex, a hub of neural networks for memory and navigation. Earlier experiments showed rats' brain cells in this area fire continuously in a rhythmic electrical signal called a theta wave when the animals are navigating through space. Some models of the brain treat theta waves as a key element of spatial navigation in all mammals, but this idea is based on rodent research, Moss said.

The Boston University-University of Maryland team tested for rhythmic electrical responses at the cellular level in bat and rat brain tissue. They found evidence for theta waves in the rat cells. But in the bat cells these waves were absent, said Moss, who has studied bats since the 1980s.

"This raises questions as to whether theta rhythms are actually doing what the spatial navigation theory proposes," said a co-author, UMD biology researcher Katrina MacLeod. "To understand brains, including ours, we really must study neural activity in a variety of animals."

Humans and other mammals share many common features of brain organization, and the differences in theta waves between bats and rats

raises questions about how spatial information is represented in all brains.

More information: "Bat and Rat Neurons Differ in Theta-Frequency Resonance Despite Similar Coding of Space," by J.G. Heys, K.M. MacLeod, C.F. Moss, and M.E. Hasselmo, *Science*, 2013.

See also: Neural activity in bats measured in-flight

Provided by University of Maryland

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