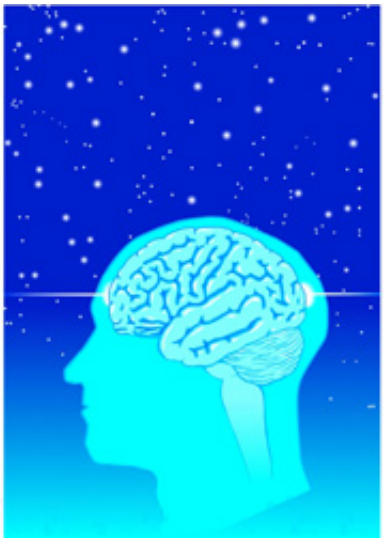
MedicalXpress

Understanding how our brain perceives space

May 28 2012



European scientists looked into the cellular properties of neurons responsible for space coordination. Insight into the neuronal network of the entorhinal cortex will help understand what determines space and movement perception, and also how it is linked to brain-related disorders.

The ability to find one's way is performed in a special site of the mammalian cortex known as the entorhinal cortex. Information regarding place, direction and destination is processed in specialised neurons called grid cells. These cells present with specific spatially firing fields that repeat at regular intervals and have been found to scale up

progressively along the dorsal-ventral axis.

Further dissection of this neural map was the subject of the EU-funded project 'Spatial representation in the entorhinal neural circuit' (Entorhinal Circuits). More specifically, scientists hypothesised that the topographic expansion of grid cells paralleled changes in cellular properties and particularly in the current (Ih) which went through hyperpolarisation-activated cyclic nucleotide-gated (HCN) channels.

Using transgenic animals with forebrain-specific knockout of the transmembrane protein HCN1, researchers found that HCN1 modulated grid cell properties, especially the size and spacing of the grid fields. This clearly indicated that HCN1 was crucial for the spatial representation in the entorhinal circuit. It also implies that during self-motion–based navigation, the current that goes through HCN1 is responsible for transforming movement signals to spatial firing fields.

Entorhinal Circuits results offered unique insights into some of the fundamental principles of neuronal assembly and microcircuit operation in the mammalian cortex. The generated knowledge will hopefully shed light into the role of the entorhinal cortex in various neuronal diseases like Alzheimer's and schizophrenia.

Provided by CORDIS