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DISTRIBUTED FUNCTIONAL BRAIN NETWORKS MAPPING VIA OPTOGENETIC FMRI

Results in Brief

Unveiling brain networks in perception

European scientists used functional imaging to map the neuronal networks in the brain responsible for perception and behaviour. The results unveil unprecedented information on the associated neuronal interconnections.



HEALTH



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A fundamental question in neuroscience is whether behaviour can be associated with specific neuronal circuit patterns. A mechanistic understanding of such neuronal activity would have to take into account the individual neurons and their synaptic interactions within various networks.

Scientists on the EU-funded MOUSE OPTO-FMRI (Distributed functional brain networks mapping via optogenetic FMRI) project proposed to study the dynamics of neuronal networks by using activation of the light-gated cation channel channelrhodopsin-2 (ChR2) alongside whole-brain functional magnetic resonance imaging (fMRI). They employed behavioural manipulations combined with optogenetic control to understand functional connections between regions that had not been studied until then.

Researchers optimised the necessary protocols to carry out awake mouse fMRI

combined with optogenetic control, and to observe behavioural responses following delivery of an external sensory stimulus. For this purpose, they developed a specialised cradle for restraining the animal in the MRI while applying input sensory stimuli and optogenetic control. The system set-up also allowed recording the animal's responses and collection of reward via a lick detector.

Scientists acquired whole-brain high-resolution maps of the entire somatomotor system in awake animals, and recorded basic perceptual behaviour. The results of the study led to novel insight into the neural underpinnings of perception and goal-directed behaviour. In particular, they identified specific organisation in the cortex that enabled them to understand the role of associated regions such as the hippocampus in sensory processing.

Taken together, the MOUSE OPTO-FMRI tools opened new avenues of experimenting to delineate the structure-function relation of sensory regions in the brain and decipher the basic neural mechanisms underlying perception.

Keywords

[Brain networks](#)

[perception](#)

[neuronal](#)

[behaviour](#)

[MOUSE OPTO-FMRI](#)

[ChR2](#)

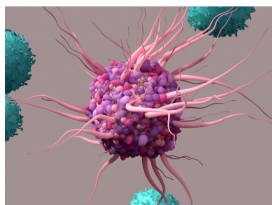
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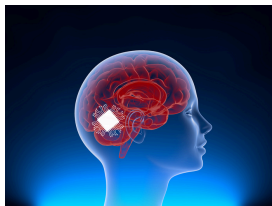
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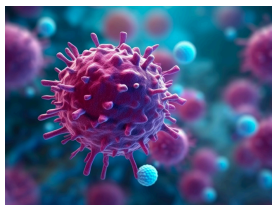
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Project Information

MOUSE OPTO-FMRI

Grant agreement ID: 294001

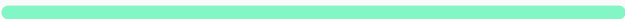
Project closed

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