Paris, 4 August 2015

Observing the brains of moving animals

Such is the brain's complexity that it is a particularly difficult organ to examine despite technological progress in this area. While electroencephalograms (EEG) and optical techniques can be used to record neurone activity in mobile animals, it is only possible to examine certain areas of the brain due to the size of the electrodes and light diffraction. Alternatively, functional ultrasound imaging (fUS) and magnetic resonance imaging (MRI) can be used to record variations in blood flow in the brain. Since active neurones need to be well-supplied with blood, blood flow in a given area reflects neurone activity in this area. However, these techniques require subjects to be completely immobile.

Two teams led by Ivan Cohen from Inserm Unit 1130 "Neuroscience Paris Seine" and Mickaël Tanter from Inserm Unit 979 "Wave physics for medicine" at the Langevin Institute (ESPCI/CNRS) have improved the fUS method to make it portable and usable with conscious and mobile rats at the same time as an EEG.

In order to demonstrate the benefits of this new method for pathological applications, the researchers looked at cerebral mechanisms in rats that reproduce epileptic seizures.

"*Thanks to this cutting-edge technology, we have precisely observed changes in blood flow which are precursors of epileptic seizure onset*", explains Inserm Research Fellow Ivan Cohen.

A study of cerebral mechanisms of mobile animals offers multiple opportunities for understanding behaviour and neurological conditions by mapping the regions of the brain associated with them. In particular, this technology will allow us to combine neurological and vascular data that play a key role in conditions such as dementia, strokes, epilepsy and Alzheimer's disease.

Sources

EEG and functional ultrasound imaging in mobile rats

Lim-Anna Sieu[1,2], Antoine Bergel[1,3], Elodie Tiran[4], Thomas Deffieux[4], Mathieu Pernot[4], Jean-Luc Gennisson[4], Mickaël Tanter[4] & Ivan Cohen[1]

1INSERM U1130, CNRS UMR 8246, University Pierre et Marie Curie UMCR18, Paris, France.
2Institut des Neurosciences Translationnelles de Paris, Paris, France.
3Frontières du Vivant (FdV) PhD College, Bettencourt Programme, Paris Diderot University, Sorbonne Paris Cité, Paris, France.
4Langevin Institute, ESPCI ParisTech, Paris Sciences et Lettres Research University, CNRS UMR 7587, INSERM U979, Paris, France.

Nature Methods, 3 August 2015

Investigator contact

Ivan Cohen
Inserm Research Fellow
Inserm Unit 1130 "Neuroscience Paris Seine" (INSERM/CNRS/UPMC)
+ 33 (0) 1 44 27 25 91 / + 33 (0) 6 69 30 84 50
ivan.cohen@upmc.fr

Mickaël Tanter
Research Director, Inserm
Inserm Unit 979 "Wave physics for medicine" (ESPCI/CNRS/INSERM/UPMC/Paris VII)
33 (0)1 80 96 30 68
mickael.tanter@gmail.com

Press contact
presse@inserm.fr

 Access the Inserm press room