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Imaging pathological activities of human brain tissue in organotypic culture

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Human Brain Organotypic Slices Culture

Background: Surgery on patients with pharmaco-resistant epilepsies of the temporal lobe, has let us develop long-term organotypic cultures of pathological human tissue.

Method: We transfected this tissue with viral vectors for cellular expression of probes that permit optical recording of epileptic activity.

Results: Transfection with AAV and LV works well in human cultures and the hSyn promoter provides a specific neuronal expression. Transfecting on the day of culture preparation provides strong, sometimes patchy, expression after 8-12 days. Thanks to the protocol we developed, Human brain organotypics cultures could be kept alive, judged by patch recordings from single neurons, for up to 6 weeks. Transfecting with probes, such as GCaMP, that report intra cellular Ca²⁺, permitted to visualize the activity of hundreds of neurons during spontaneous epileptiform activities.

Perspectives: We generalized this techniques to other human tissues such as those in the zone surrounding cortical tumors and the protocol could be very helpful for preclinical studies on human brain such as : Pharmacological tests for diagnosis; therapeutics or mecanistics

Cellular therapy: Cell engraftment on slices to study integration, differentiation connections with existing neurons and repairing mecanisms

Gene therapy : Genetically modified cells engraftment to express a therapeutic molecule.

Fondamental research tool : proliferation, migration, cellular differentiation.

Disease model: epilepsy, NMDA, Prion, Neuro demyelinating diseases.

Biography

Etienne Savary has completed his PhD at the age of 28 years from Medical University Montpellier and performed postdoctoral studies at the Brain and Spine Institute (C.H.U. Pitié-Salpêtrière, Paris) from 2013 to 2017 in the cortex and epilepsy group directed by Richard Miles. His principal task has been to develop techniques to maintain and exploit organotypic cultures of human brain from patients with epileptic syndromes. (J Neurosci Methods. 2018 Mar, 15;298:33-44. Imaging pathological activities of human brain tissue in organotypic culture.) He is now teaching his protocol to other laboratories through its company HBOSC (Human Brain Organotypic Slice Culture).

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