In vivo local field potential recording (LFP) from the hippocampus of an anesthetized mouse

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The LFP signal recorded by means of an electrode implanted in the brain tissue results from the electrical activity of the surrounding neurons. The major contribution to the LFP signal is due to the synchronous activity at the synapses of neuronal ensembles, that is neurons that fire action potential simultaneously and whose activity sum up in the extracellular milieu giving rise to appreciable fluctuations of the LFP. The periodic activity of neuronal ensembles accounts for the oscillations in the LFP signal that are also known as brain waves.

The LFP signal may be dominated by different brain oscillations – in terms of wave frequency – depending on the brain region and cognitive state. For instance, in the hippocampus, which is the brain region primarily involved in memory processing, the most prominent oscillations are in the theta (4-12 Hz) and gamma (30-90 Hz) bands.

During the demonstration, procedures employed for the recording of the LFP signal through a single Ag/Cl electrode in a specific region of the brain of a living anesthetised animal will be introduced. Specifically, we will target the hippocampus of a mouse under urethane anaesthesia and record the spontaneous ongoing activity in order to assess the power of the theta and gamma waves.

Here are the major steps in the protocol that will be performed:

- Urethane anaesthesia
- Head restraining in a stereotaxic frame
- Scalp surgery
- Identification of the coordinates for electrode insertion
- Skull drilling
- Electrode insertion