

# Workshop Program

## WORKSHOP PROGRESS

The welcome of the participants takes place from 8h30 to 8h40.

### Morning

8h45-10h00 workshop  
 10h00-10h15 coffee-break  
 10h15-12h00 workshop

12h00-13h15 lunch

### Afternoon

13h15-15h15 workshop  
 15h15-15h30 coffee-break  
 15h30-17h30 workshop

	Monday	Tuesday	Wednesday	Thursday	Friday
Morning	THEORY:  History and concept	THEORY:  In-vivo	PRACTICAL APPROACH:  IN VITRO (GROUP 1)  IN VIVO (GROUP 2)	PRACTICAL APPROACH:  IN VITRO (GROUP 2)  IN VIVO (GROUP 1)	PRACTICAL APPROACH:  Data Analysis  GROUP 1 et 2
Afternoon	THEORY:  In-vitro	THEORY:  In-vivo & In-vitro Data analysis	PRACTICAL APPROACH:  IN VITRO (GROUP 1)  IN VIVO (GROUP 2)	PRACTICAL APPROACH:  IN VITRO (GROUP 2)  IN VIVO (GROUP 1)	Round table  Evaluation  Delivery of contents

## **DETAILED PROGRAM**

# **History of electrophysiology**

Electrophysiology: discovery, applications and evolution.

Interest of electrophysiology

Current applications and what E-Phy-Science capabilities.

## **IN VITRO**

### **Theory:**

- Possible models: cultures, acute slices
- Description of main steps
  - o Solutions
  - o Slice preparation
  - o The recording set-up
- Extracellular recording and long term potentiation
- Patch-clamp method :
  - o Description of different possible configurations
  - o The key steps to record in a whole-cell configuration

### **Practice:**

- Material overview
- Hippocampal slices preparation
- Whole-cell & patch clamp recordings
- Extracellular recording and electrical induction of long term potentiation

## **IN VIVO**

### **Theory:**

- General ethics rules : authorization, ethics committee
- Anesthetized animal model
  - o Generalities
  - o Technical aspects: anesthetics, electrodes
  - o Recording protocols
- Freely moving animal
  - o Generalities
  - o Technical aspects: electrode configuration and location
  - o Recording protocols
  - o Combination with behavior

### Practice:

- Electrodes preparation
- Presentation and preparation of surgical equipment
  - o Sterilization
  - o Surgery station preparation
- Stereotaxic surgery: multi-site electrodes implantation
  - o Animal anesthesia
  - o Placement of the animal in the stereotaxic apparatus
  - o Electrodes placement in the structures of interest
  - o Fixation of the recording system
- Post-operative care
  - o Establishment of score grids
  - o Establishment of endpoints
- Recording on awake/anesthetized animal
  - o Presentation of the recording system
  - o Extracellular recordings of action potentials and field potentials
- Histological controls: verification of electrode placement

## **SIGNAL ANALYSIS**

### Theory:

- Presentation of several software for recording analysis (examples: pClamp, OpenElectrophy).
- Analysis of intracellular activity recordings:
  - o Identification of the neuronal electrophysiological properties (discharge rate, action potential characteristics, input resistance, time constant, current-voltage curve)
  - o Analysis of synaptic activities
  - o Dose response
- Recording analysis of extracellular signal recorded on brain slice
  - o LTP
- Recording analysis of extracellular signal recorded in-vivo
  - o Filtering
  - o Spike sorting and discharge analysis: frequency, type, spike distribution histogram, inter-spike interval.
  - o Local field potential : study of oscillations with FFT, auto-correlogram, time-frequency map
  - o Correlation
    - Between local field potentials
    - Between local field potential and spike
    - Between behavioral and electrophysiological signal

### Practice:

- Analysis of the recordings collected by the participants the two previous days
- Analysis demonstration with OpenElectrophy