Doctoral School: **Biology Doctoral School**
Doctoral Program: Neuroscience and Human Biology

Subject code: **BIO/7/18**
Subject title: **Electrophysiology PR**
Teacher and Neptun code: **Dr. Détári László (D7ZI0N)**
Credits: 4
Class hours: 2 hours/week, practical

Aims of the course

The aim of the seminar practice is to provide basic theoretical and practical knowledge about electrophysiological techniques; students can gain theoretical and practical experience needed to perform the measurements.

Contents of the course

1. Electrophysiological characteristics of the neuronal membrane. Physicochemical bases, determination of resting membrane potential, synaptic potentials, action potential formation and propagation.
2. Instruments for measuring bioelectrical signals I. Types of electrodes (micro, macro, metal, glass, suction electrode, ion-selective electrodes), their properties, their applicability.
3. Instruments for measuring bioelectrical signals II. Preamplifiers, filters, stimulators, signal storage devices.
4. Methods for stimulation of biological preparations. Electrical, chemical and field stimulation. Explanation of the stimulation artifact and options for its reduction.
5. In vivo techniques I. Understanding extracellular single cell and multiunit activity measurements. Acute and chronic preparations. Fixed and mobile electrodes.
6. In vivo techniques II. Activity pattern analysis, separation according to curve shape, autocorrelogram and cross-correlogram. Identification techniques, learning about antidromic stimulation.
7. In vitro, ex vivo techniques I. Getting to know the surviving brain slice preparation, the advantages and limitations of the technique.
8. In vitro, ex vivo techniques II. Getting to know the technical equipment, recording chambers, drug administration possibilities.
9. In vitro, ex vivo techniques III. Neuronal identification methods, different possibilities to study neuronal function.
10. In vitro, ex vivo techniques IV. Synaptic plasticity studies, methodology for induction and measurement of synaptic efficacy changes.
11. In vitro, ex vivo techniques V. Theoretical background of the patch-clamp technique.
12. Recording and cell identification demonstrations. Demonstration and measurement of ion currents in neurons.
13. Recording and cell identification demonstrations. Cell identification procedures.
14. Written test assessing theoretical and practical knowledge.

Requirements

Written test
Grade is determined by the test result.

Literature

Slides available in pdf, online textbook chapters