
Department of Pathological Physiology

The scientific activity of the Institute of Pathological Physiology is electrophysiological research of visual perception and brain functions and its possible diagnostic applications. Our main focus is on neuro-ophthalmology, but we also work closely with other clinical departments such as infectious diseases, psychiatry and paediatric clinics. Our activities take place in the Electrophysiology Laboratory, which was founded in the 1970s by Prof. J. Peregrine and Prof. J. Svěrák and which has been a joint department of the Institute of Pathological Physiology and the Institute of Medical Biophysics since 1 October 2019. It is probably the most important laboratory of its kind in the Czech Republic and the only Czech representative in the International Society for Clinical Electrophysiology of Vision (ISCEV). Our laboratory has a number of priority results in the field of research on motion evoked potentials and visual "mismatch" negativity and their practical application. We are currently testing a mobile device we have developed for VEP testing and are pursuing its commercial use (<https://www.veppeak.com/>). The instrumentation allows us to combine functional (VEP, ERP, EEG) and morphological approaches (refractometry, OCT) in the area under investigation.

The investigation of a wide range of VEPs and cognitive potentials, which exceeds the international standards set by the ISCEV recommendation and significantly increases its sensitivity, can be considered a specific activity of the pathophysiological part of the laboratory. These activities also result in a relatively high citation rate of our publications.

Main research topics

- Analysis of VEP non-stationarity as a new potential diagnostic criterion
- Application of the VEPpeak mobile device for the objectification of cognitive changes in psychiatric diseases (e.g. schizophrenia)
- Distance visual rehabilitation of visually impaired elderly with macular degeneration

Scientific research groups

The core scientific research team consists of all university and college staff of our department, as well as some staff of the Institute of Medical Biophysics, who jointly address research topics. It is a group focused on the electrophysiology of visual perception.

Equipment

- 16 VEP - TrueTrace (Deymed) - registration of visual evoked potentials, possibility of recording eye movements
- 64-channel EEG - TrueScan (Deymed) - mapping of brain activity with a sampling rate of up to 3 kHz
- HEP perimeter (Heidelberg Engineering) - computerised perimeter for flicker stimulus examination
- OCT Spectralis (Heidelberg Engineering) - retinal examination with resolution of micrometer units
- EyELink 1000 plus (SR research) - eye movement registration device
- NeuroConn DC stimulator Plus (neurocare group AG) - single channel device for non-invasive transcranial current stimulation
- MagStim R30 (Magventure) - TMS device for non-invasive transcranial repetitive stimulation

Achievements

2018, 2020 Marmor Award for Clinical Innovation in Visual Electrophysiology