

BAY-GEN

Institute for Plant Genomics, Human
Biotechnology and Bioenergy



Neurodegenerative diseases competence



Description

Our group uses fluorescence and electrophysiological techniques (*in vitro*, *ex vivo*, *in vivo*), high-throughput transcriptome and proteome methods to record neuronal activity at different levels: from brain slice preparations, anesthetized animals, to freely moving behaving animals. These methods make possible the experimental modeling of neurodegenerative diseases, e.g. Alzheimer's disease.

Approximately 10% of the population over 65 years is affected by Alzheimer's disease (AD) related neurodegenerative disorders that is characterized by neuronal death, memory loss, confusion and a variety of cognitive disabilities. One of the key events in AD is the formation of neurotoxic aggregates of amyloid- β -peptide (A β). The pathomechanism of AD has not been fully understood yet.

Brain cells communicate with each other by means of small electric signals, so called action potentials. These signals are being transferred between two cells at the synapse by a given probability (strength of the synapse). Synapses are plastic that is the strength could be altered, and this mechanism may represent in the background of learning and memory processes deteriorating first during the onset of AD.

Understanding the synaptic and network activity of a "behaving" brain is a demanding task, but provides in-depth understanding of disease mechanisms.

Application fields

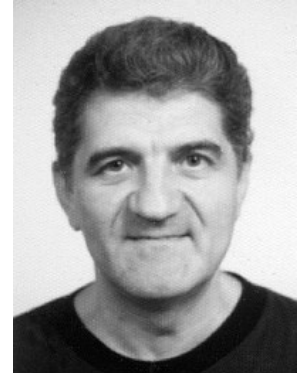
- Drug research
- Toxicology
- Transgenic mouse phenotyping
- Neurology

Human resources

- Prof. Dr. Botond Penke, *representative of the competence*
- Dr. Zsolt L. Datki, scientific coworker
- Dr. Viktor Szegedi, scientific coworker
- Robert G. Averkin, scientific coworker
- Dr. Dezso Virok, scientific coworker

Competence fields and services

- Fluorescence techniques (microscope, micro-plate-reader, spectrophotometer)
- Chronic single-unit and fEPSP (field excitatory post-synaptic potential) recordings in combination with behavioral tests
- Microiontophoresis, microdialysis
- Synaptic plasticity
- Behavioral tests
- Transcriptome, proteome, interactome analyses



*Dr. Botond Penke
representative of the
competence*

PhD, DSc degrees

*Member of the Hungarian
Academy of Sciences*

*5 years research activity in
abroad (USA, France,
Germany)*

4 international patents

*360 refereed international
publication*

Cumulative IF: 516

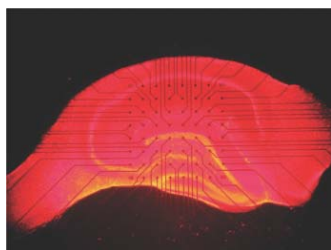
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3223*

Innovation directions

- Development of a simple and novel *Ex Vivo System* (EVS): Universal Mini-Chamber Tube System for Acute Tissue Slices



- Using acute hippocampal or neocortical live slices in micro-plate-reader system



- Novel multi electrode array brain implants for small animals (in cooperation with Neuronelektrod Kft.)
- Novel microdrivers for precise advancing of the chronically implanted electrodes in behaving animals; Novel microdrive –positioner systems for acute studies.



International partners

Oxidation Disorders Research Unit, Mental Health Research Institute of Victoria, University of Melbourne, Australia.

Kation Scientific Ltd. MN, USA

Institute of Higher Nervous Activity, RAS, Moscow, Russia

Alpha-Omega Engineering , Israel

Hungarian partners

Gedeon Richter Plc.

Neuronelektrod Ltd.

Institute of Experimental Medicine

University of Szeged

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*Bridging
Innovation*

