

Bioorganic NMR analysis methods for early detection of neurodegenerative diseases and drug development

Summary

The aim of this project is to develop novel bioorganic NMR structural and functional analysis methods, mainly for early detection of Alzheimer's and Parkinson's disease by investigating the metabolic changes taking place in their progression, and also for drug development.

Research field:	Physical Sciences
Supervisor:	Ago Samoson
Availability:	This position is available.
Offered by:	School of Science Department of Cybernetics
Application deadline:	Applications are accepted between November 15, 2021 00:00 and December 15, 2021 23:59 (Europe/Zurich)

Description

This project focuses on developing bioorganic NMR structural and functional analysis methods. Early detection of neurodegenerative diseases and drug development from natural resources will be addressed. The focus is on Alzheimer's and Parkinson's disease, the investigation of the metabolic changes taking place in their progression and developing a method that would allow the diagnosis of the prodromal phase of the disease. The resulting diagnostics method could also allow us to assess the effectiveness of proposed therapeutic strategies for the patients. Secondary metabolites of various medicinal plants will be studied, in conjunction with the interactions between candidate drug molecules and the effector molecules of these diseases.

The PhD student will be responsible for analyzing blood, urine, and saliva samples from the patients in different disease stages, individuals with increased risk of developing these diseases, and healthy controls, by using various metabolic NMR methods (e.g. 1D NOESY & KSD), and actively contributing to the optimization and advancement of the methods. The tasks also involve analysis of medicinal plants, extracting and identifying possible candidate drug molecules by applying various spectroscopy methods (e.g. pure shift NMR, spectral fluorescence signature, GC-MS, LC-MS) and conducting experiments to elucidate the molecular mechanisms of the inhibition of alpha-synuclein and amyloid beta aggregation, oligomerization, and fibrillation with suitable methods (e.g. fluorescence spectroscopy with thioflavin-T, nD NMR). In addition to advancing the bioorganic NMR methods for analyzing solutions, the PhD student will be participating in the development of possible applications of novel H-MAS for solids and viscous systems such as plant cell wall structures.

Applicants should fulfil the following requirements:

- Masters degree in sciences
- Profession of local and English languages



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