

# Relations between copper metabolism and Alzheimer's disease studied in *Drosophila melanogaster* model system

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## Summary

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*Alzheimer's disease (AD) is an age-dependent neurodegenerative disease with enormous personal tragedy and socio-economic concerns. AD is multifactorial disease and despite intensive research, the reasons of AD are still unknown. There is an increasing number of facts pointing to the relation of AD with metabolic disorders of copper in the brain. It is generally known that copper levels in AD brain are decreased especially in amygdala and hippocampus, however, extracellular copper levels are increased. Elevated copper content may be associated with the formation of amyloid plaques as in vitro experiments demonstrate that copper can bind to A $\beta$  peptides, the major constituents of amyloid plaques, and initiate their aggregation. Similar processes may take place also in brain as amyloid plaques contain up to millimolar concentrations of copper ions and it is hypothesized that copper ions, bound to amyloid plaques are toxic to the neurons. *Drosophila melanogaster* is a convenient model for studies of neurodegenerative diseases where different disease causing genes could be expressed in nervous system or in fly eye cells. Major aim of the current project is finding relationships between copper metabolism and AD phenotype in different *Drosophila melanogaster* strains and finding molecular tools for its regulation.*

Research field:	Chemistry and biotechnology
Supervisor:	Prof. Dr. Peep Palumaa
Availability:	This position is available.
Offered by:	School of Science Department of Chemistry and Biotechnology
Application deadline:	Applications are accepted between June 01, 2022 00:00 and June 30, 2022 23:59 (Europe/Zurich)

## Description

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In the current PhD project we try to understand the role of copper metabolism in AD by using insect AD models. Main focus of the project will be directed towards design of AD model flies with distorted copper metabolism and search of copper-regulating compounds, which can regulate the copper metabolism in favorable direction and alleviate cellular pathology or AD phenotype in insect model. Obtained knowledge will be used for elaboration of new therapeutic tools for prevention or treatment of AD

## Responsibilities and (foreseen) tasks

- conducting of experiments with AD model flies
- generation of new strains of *Drosophila melanogaster*
- determination of metals from various cellular and tissue samples
- analysis of results
- publication of papers

## Applicants should fulfil the following requirements:

- a master's degree in biotechnology or gene technology
- a clear interest in the proposed research topic
- experience in analytical chemistry of metal measurements
- experience for work with insects
- tendency for analytical thinking

## The following experience is beneficial:

- light microscopy
- confocal fluorescence microscopy
- scanning electron microscopy
- working with cells

## **We offer:**

- 4-year PhD position in Lab of Metalloproteomics at the Department of Chemistry and Biotechnology
- The chance to do high-level research in field of metalloproteomics and Alzheimer's disease
- Opportunities for conference visits and research stays in leading universities in the fields of bioinorganic chemistry and Alzheimer's disease

## **About the department**

The Department of Chemistry and Biotechnology of Tallinn University of Technology focuses on research and teaching in fields of chemistry, molecular biology, gene technology and biotechnology. Our department is proficient with the main molecular and cell biology techniques, including DNA cloning, construction of plasmids and recombinant host cells. In our department we have access to two confocal microscopes, ultra-high definition ESI QTOF MS (6540 UHD, Agilent), facilities for cultivation of various cells equipped with laminar boxes and CO incubators and a well-equipped laboratory space dedicated to Drosophila research.

Metalloproteomics lab at Tallinn University of Technology is equipped with an ICP MS (Agilent 7800), MALDI-TOF MS (Bruker Microflex LT), chromatography systems (Äkta Explorer, Purifier and FPLC, HPLC Agilent 1200 Infinity, UHPLC from Shimadzu), UV-Vis and luminescence spectrophotometers (Shimadzu UV-2401 & Perkin Elmer LS 55 and 45). We also have free access to an in-house protein crystallography lab, equipped with plate making robots, a plate hotel and an X-ray diffractometer (Compact HomeLab, Rigaku).

## **Additional information**

For further information, please contact Prof Peep Palumaa [peep.palumaa@ttu.ee](mailto:peep.palumaa@ttu.ee) or visit <https://taltech.ee/keemia-ja-biotehnoloogia-instituut/uurimisruhmad#p22440>



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