

Title: Probing molecular mechanisms underlying neuropsychiatric disorders.

Supervisor: Justyna Zmorzyńska, PhD, DSc. habil.

Institute: International Institute of Molecular Mechanisms and Machines (IMol), PAS

Laboratory: Laboratory of Developmental Neurobiology

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Project description:

Neuropsychiatric disorders such as autism spectrum disorder (ASD), anxiety, and intellectual disability (ID) are prominent features of Tuberous Sclerosis Complex (TSC), a condition caused by mutations in the TSC1 or TSC2 genes. While hyperactivation of mTORC1 underlies tumour formation and epilepsy in TSC, the severity and presentation of TSC-associated neuropsychiatric disorders (TANDs) do not fully correlate with mTORC1 activity. Our findings demonstrate that disruptions in white matter development and long-distance inter-hemispheric connectivity contribute to anxiety-like behaviours in a zebrafish model of TSC, consistent with clinical observations of impaired white matter integrity in TSC patients with ASD as early as the first two years of life. This suggests that abnormal white matter development is a key mechanism driving neuropsychiatric phenotypes.

Aim:

To further elucidate the molecular mechanisms of neuropsychiatric disorders, we adopt an integrative, multi-level approach to assess what molecular mechanisms shape brain connectivity and behavioural outcomes. Using zebrafish semi- and high-throughput behavioural assays, advanced microscopy, and computer vision, these projects aim to systematically uncover how the development of white matter influences neuropsychiatric traits.

Requirements:

- MSc degree in biology, biochemistry or related field.
- Solid knowledge in at least one of the following disciplines: neuroscience, developmental biology, molecular biology, biochemistry, or microscopy and novel imaging techniques.
- Basic hands-on experience in one of the fields: molecular biology, cell biology, fluorescent microscopy.
- Willingness to work with a zebrafish animal model.
- Prior experience in working with animal models, as well as basic programming skills would be an advantage but not essential.
- Keen interest in neurodevelopment, connectivity development, and molecular mechanisms underlying behavior.
- Written and spoken fluency in English.
- Willingness to learn and take new challenges, ability to work independently, analytical thinking.
- Good interpersonal skills and a collaborative attitude

Number of positions available: 2

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