DANDRITE
Danish Research Institute of Translational Neuroscience
Nordic EMBL Partnership for Molecular Medicine

AARHUS UNIVERSITY

DANDRITE Topical Seminar

Tuesday 25 June 2019
13:15 – 14:00

Auditorium G1, building 1532, room 116
Ny Munkegade 116, 8000 Aarhus C

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Function and development of habenular networks

The habenula is a midbrain nucleus that is involved in modulating behaviors ranging from associative learning to social interactions. Many of such complex behaviors develop with age. For example, juvenile zebrafish display increased social interactions and perform better during associative learning tasks, compared to larvae. The maturation of neural circuits, including habenula, could underlie an increase in cognitive capacity and the development of such complex behaviors. Previously, we have shown that the habenula exhibits spontaneously generated ongoing activity that is spatially structured into functional subdomains, which are specifically driven by the activity of sensory and limbic brain regions. These results indicated that ongoing habenular activity could potentially influence the processing of sensory stimuli depending on the animals' internal behavioral state. It is however less clear how these neural computations and ongoing habenular activity are altered across development, as animals gradually expand their behavioral repertoire.

To investigate the function of the developing habenula we used a combination of molecular and optical tools. We observed that as the habenula grows in size, neurons are integrated with a spatial order and new inhibitory connections are formed. Moreover, while the habenular sensory responses are already present at early developmental stages, the nature of the habenular ongoing activity changes drastically during development. Our results highlight a spatial restructuring, faster temporal kinetics and increase in robustness and complexity of ongoing habenular activity patterns as animals develop. Finally, by developing a labelling technique for birth-dating of neurons in living animals, we demonstrated that distinct functional clusters of habenular neurons are born at different developmental stages. Our results are in line with the idea that neuronal birthdate and function are strongly related. We propose that this functional refinement of neural circuits underlies the transition of developing zebrafish larvae into a mature animal with an expanded cognitive capacity already at the juvenile stage.

Host: DANDRITE Group Leader Duda Kvitsiani, Dept. Molecular Biology and Genetics, Aarhus University