Research Unit Sensory Biology & Organogenesis

Highlight / Publication:
1. Hair-cell identity establishes labeled lines of directional mechanosensation.
PLoS Biology, 16(7):e2004404, 2018 https://www.ncbi.nlm.nih.gov/pubmed/30024872

2. Neuroplasticity in the acoustic startle reflex in larval zebrafish
Current Opinion in Neurobiology 54:134-139, 2018
https://www.ncbi.nlm.nih.gov/pubmed/30359930

3. Systemic loss of Sarm1 is glioprotective after neurotrauma
bioRxiv 493163, 2019
https://www.biorxiv.org/content/10.1101/493163v1

4. Acoustic scattering mediated single detector optoacoustic tomography
arXiv:1902.05948, 2019
https://arxiv.org/abs/1902.05948

PSP Element:
G-500100-001

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Keywords:
Cellular stress response, regeneration, optogenetics, intravital microscopy

Central statement of the highlight in one sentence:
Systematic dissection of the neuronal circuits that relay external and internal sensory information to the brain to regulate behaviour and energy homeostasis. Cellular responses to physical and metabolic stress, and reparative processes.

Text of the highlight:
Sensory systems sense external and internal signals to inform the central nervous system about the environment and the physiological status of the organism. The developmental and homeostasis of these systems are, therefore, essential for life. We are systematically dissecting the assembly, maintenance and repair of sensory organs and their associated neurons. In addition, we are integrating our fundamental discoveries into research efforts to understand and address sensory neuropathies. Importantly, sensory neuropathies are common in patients suffering from diabetes. They are complex and thus difficult to study. We are capitalising on the experimental advantages afforded by the zebrafish to model diabetic neuropathies in the whole organism, and combine genetic, molecular and bioinformatic approaches with optical methods to sense and reprogram the physical and physiological status of the relevant cells to understand cellular responses to stress. Our integrated approach is aimed at testing specific hypotheses about fundamental aspects of disease development and progression and test their clinical relevance. Over the past year we also have used optogenetics, pharmacology and high-resolution intravital imaging, and machine learning to investigate the regeneration of sensory systems, and to discover means to protect peripheral glial

cells from chemotoxicity. Our findings have implications for therapies aimed at sensory-system repair after traumatic, metabolic or chemical insult.

Taking account of the HMGU mission:
Peripheral neuropathies are sensory-nerve and glial degenerative pathologies caused by metabolic or genetic disorders. Diabetic neuropathies, in particular, have an incidence of 10% to up to 100% in adult patients, resulting in defective vision and vestibular function, numbness or pain in the lower extremities. Experimental and clinical evidence indicates that diet content can affect the onset, severity and progression of neuropathies. Notwithstanding recent progress, our knowledge about the effects of alcohol intake on diabetic neuropathies remains fragmentary. Our projects aim at understanding the cellular and molecular responses of the nervous system to hyperglycæmia and other metabolic and traumatic challenges.

The internal HMGU co-operation partners with whom the highlight was compiled, if appropriate:
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