Research Unit Sensory Biology & Organogenesis

Highlight / Publication:
Lozano-Ortega M, Valera G, Xiao Y, Faucherre A, **López-Schier H**. Hair cell identity establishes labeled lines of directional mechanosensation. PLoS Biol. 2018 Jul 19;16(7):e2004404. doi: 10.1371/journal.pbio.2004404. eCollection 2018 Jul. PubMed PMID: 30024872; PubMed Central PMCID: PMC6067750

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Keywords:
Neuropathies, peripheral nervous system, optogenetics, live imaging

Central statement of the highlight in one sentence:
How sensory information is transmitted to the brain to create a central representation of the internal and external world.

Text of the highlight:
Sensory systems inform the central nervous system about the internal and external environment, which ultimately triggers appropriate behavioral reactions in a wide range of orhanisms. We are systematically dissecting the assembly of neuronal first-order projections, whose study is important because is likely to form the basis of a neuroanatomical code that relays sensory information to the brain to create a central map of the sensory field. Currently, we are engaging on an integrative biomedical approach to understand peripheral neuropathies. Neuropathies of the peripheral nervous system that develop in patients suffering from diabetes, for example, are complex and difficult to study. The experimental advantages afforded by the zebrafish are allowing us to model diabetic neuropathies in the whole organism, and to combine genetic, molecular and bioinformatic approaches with optical methods to sense or reprogram the metabolic status of the relevant cells. This work is aimed at testing specific hypotheses about fundamental aspects of disease development and progression, whose results are integrated to collaborative efforts with physicians to test their clinical relevance. Over the past year we have used high-resolution intravital imaging and machine learning to investigate the regeneration of sensory organs. Our findings have implications for therapies aimed at sensory repair after traumatic or metabolic injury.

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.