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SFB 1089

Bonn Lecture Series in Neuroscience

microRNA function in mammalian synapse development and homeostasis

Prof. Dr. Gerhard Schratt

Head of Institute for Neuroscience,
ETH Zürich

Tuesday, June 4th, 2019, 4.00 pm
Clinic for Epileptology, Conference room, Ground Floor

The experience-dependent control of gene expression is critical for the correct development and plasticity of neural circuits, and aberrations in this program cause neuropsychiatric disorders, such as autism-spectrum disorders and epilepsy. In our lab, we are focusing on non-coding RNAs, in particular microRNAs, as an important post-transcriptional gene regulatory layer. We have identified specific microRNAs that control neuronal morphology at the level of dendrites and spines by fine-tuning the local translation of mRNAs at synapses. Furthermore, we have characterized molecular mechanisms underlying the transport, processing and activity of synaptic microRNAs. More recently, we have uncovered functions of microRNAs in neural circuit homeostasis in vivo with implications for ASD and epilepsy. Currently, we are attempting to obtain a more systems-level view of post-transcriptional regulation in the mammalian brain, integrating microRNAs with other non-coding RNA species and RNA-binding proteins. These studies promise to enhance our mechanistic understanding of experience-dependent neural circuit development and might pave the way for novel RNA-based therapeutic approaches in neuropsychiatric conditions.

Selected Publications

Lackinger M, Sungur AÖ, Daswani R, Soutschek M, Bicker S, Stemmler L, Wüst T, Fiore R, Dieterich C, Schwarting RK, Wöhr M, **Schratt G**. A placental mammal-specific microRNA cluster acts as a natural brake for sociability in mice. EMBO Rep. 2019 Feb;20(2).

Rajman M, Metge F, Fiore R, Khudayberdiev S, ... Dieterich C, **Schratt G**. (2017) A microRNA-129-5p/Rbfox crosstalk coordinates homeostatic downscaling of excitatory synapses. EMBO J. 36(12): 1770-1787.

Valluy J, Bicker S, Aksoy-Aksel A, Lackinger M, Sumer S, Fiore R, Wüst T, Seffer D, Metge F, Dieterich C, Wöhr M, Schwarting R, **Schratt G**. (2015) A coding-independent function of an alternative Ube3a transcript during neuronal development, Nature Neuroscience 18(5):666-73.

Fiore R, Rajman M, Schwale C, Bicker S, Antoniou A, Bruehl C, Draguhn A, **Schratt G**. (2014) miR-134-dependent regulation of Pumilio2 is necessary for homeostatic synaptic depression, EMBO J, 33(19):2231-46.

Siegel G.*, Obernosterer G.*, Fiore R., Oehmen, M., Bicker, S., Christensen M., Khudayberdiev, S., Leuschner, P., Busch, C., Kane, C., Hübel K., Dekker, F., Hedberg, C., Rengarajan, B., Drepper, C., Waldmann H., Kauppinen S., Greenberg M.E., Draguhn, A., Rehmsmeier M., Martinez J. and **Schratt G**. (2009) A functional microRNA screen implicates miR-138-dependent regulation of the depalmitoylation enzyme APT1 in dendritic spine morphogenesis. Nature Cell Biology, 11(6):705-716.

Host contact: Prof. Dr. Susanne Schoch, susanne.schoch@uni-bonn.de