

Centre de Neurosciences Psychiatriques

CNP SEMINAR

ANNOUNCEMENT

Monday 13th May 2024, 14:00 - 15:00

Ionic plasticity of GABAergic signaling in brain development and disease

By: Prof. Kai Kaila

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Summary:

Much of Dr. Kaila's work has been on GABAergic inhibition and excitation, with a focus on ion-regulatory proteins (IRPs), including the neuron-specific K-Cl cotransporter KCC2, the ubiquitous Na-K-2Cl cotransporter NKCC1 and Carbonic Anhydrase isoform 7. As already pointed out by Sherrington, neuronal inhibition is not a simple brake but a major organizer of (in current terminology) neuronal network functions. We know now that the most fundamental properties of GABA_AR-mediated signaling are modified by changes in IRP functions during brain development, and in practically all brain disorders which have been examined so far. Ongoing work in this rapidly expanding field points to a major role of IRPs in neuroinflammatory effects and in aging of the brain. Major misconceptions in this field will also be addressed, including the modes of action of bumetanide (an NKCC1 blocker) in CNS disorders, and the "NKCC1/KCC2 ratio" in the context of the so-called excitation-inhibition balance. The research in Kaila's lab builds on an evo-devo framework, acknowledging that CNS disease processes have both adaptive and maladaptive components.

Invited by : ron.stoop@unil.ch

Short Bio:

Prof. Kai Kaila is currently Research Director at the Molecular and Integrative Sciences Program and Neuroscience Center at the University of Helsinki (UH). He has been the chairman of three life science institutes at the UH; and the founder and director of Graduate Schools in Neuroscience in Finland and elsewhere in Europe. Much of his lab's work is on GABAergic inhibition, with a focus on ion-regulatory proteins. In addition, he studies the mechanisms and consequences of seizure activity, neonatal hypoxic-ischemic encephalopathy and – more recently – the effects of neuroinflammation on neuronal signaling. Kaila has been awarded the Academy Professorship (Academy of Finland) for three 5-year terms; the ERC Advanced Grant 2014-2019; and the Ulf von Euler Prize (Scand Phys Soc 2024). H-index 85 (GScholar); Orcid ID 0000-0003-0668-5955



Publications:

- Kaila K et al/De Curtis M (2024). GABA_A-receptor signaling and ionic plasticity in the generation and spread of seizures. In: J.L. Noebels et al, *Jasper's Basic Mechanisms of the Epilepsies* (5th ed.), OUP.
- Kurki SN et al./Kaila K (2023). Acute neuroinflammation leads to disruption of neuronal chloride regulation and consequent hyperexcitability in the dentate gyrus. *Cell Rep.* 42(11):113379. DOI: [10.2139/ssrn.4425877](https://doi.org/10.2139/ssrn.4425877)
- Virtanen MA et al/Kaila K (2021). The multifaceted roles of KCC2 in cortical development. *Trends Neurosci* 44:378-392. DOI: [10.1016/j.tins.2021.01.004](https://doi.org/10.1016/j.tins.2021.01.004)
- Spoljaric A et al/ Kaila K (2017). Vasopressin excites interneurons to suppress hippocampal network activity across a broad span of brain maturity at birth. *Proc Natl Acad Sci U S A.* 114(50):E10819-E10828. [10.1073/pnas.1717337114](https://doi.org/10.1073/pnas.1717337114)
- Kaila K, et al (2014). Cation-chloride cotransporters in neuronal development, plasticity and disease. *Nature Rev Neurosci* 15:637-654. DOI: [10.1038/nrn3819](https://doi.org/10.1038/nrn3819)

Salle de séminaire 1er étage – du Centre des Neurosciences Psychiatriques (CNP)-
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Link for videoconference

<https://chuv.webex.com/chuv/j.php?MTID=m51a0b15115b9b97f83c28e29839f9706>