

Introductory Remarks to Symposium 35

New perspectives on the locus coeruleus - noradrenergic activity during sleep and its role in memory function

Oxana Eschenko and Sara Mednick, Tuebingen and Irvine (USA)

This symposium is devoted to renewed interest in the impact of noradrenergic neuromodulation during sleep. Pioneering work revealed greatly reduced activity of the brain stem noradrenergic nucleus Locus Coeruleus (LC-NE) during sleep and directed the focus of research toward the role of LC-NE during vigilant states. However, already earlier studies highlighted the importance of noradrenergic transmission during unconscious (or 'offline') states like sleep; these findings were consistent with a facilitatory role of LC-NE for synaptic plasticity. Recently, the role of LC-NE during sleep has been reconsidered opening up new perspectives on the LC-NE involvement in sleep-mediated memory consolidation. The speakers will share the latest advances on the LC-NE as a regulator of the brain state, sleep microarchitecture, autonomic function, and sleep-mediated memory consolidation. Artemis Gkinakou will highlight the role of sleep in vocal learning. Oxana Eschenko will speak about the coordinated firing of the LC-NE neurons with forebrain oscillations implicated in memory consolidation. Anita Lüthi and Celia Kjærby will share how methodological advancements enabled monitoring of NE release at a fine temporal scale and revealing distinctive fluctuations of LC-NE activity during sleep; this LC-NE activity dynamics is implemented in the regulation of the sleep architecture and memory performance. Our final speaker, Sofie Smith Jacobsen will present the results of a collaboration with Sara C. Mednick and highlight the role of the LC-NE system in coupling the autonomic and central nervous system in human sleep. Sofie will also share new evidence of the interaction between autonomic activity and memory consolidation during sleep in mice and compare the findings in humans and rodents. All speakers will present experimental evidence that interference with the natural LC-NE rhythmicity caused a disturbance in the sleep cycle and memory. Based on highly coherent results from multimodal experimental work in animals and humans, we will suggest the functional significance of these novel findings in health, aging, and disease. The clinical use of noradrenergic drugs makes the assessment of the effect of medication on cognitive functions of high importance. Despite some obvious health benefits, the pharmacological alteration of NE levels may, as a side effect, impair patients' mental states.

Symposium 35

*Saturday, March 29, 2025
11:30 - 13:30, Lecture Hall 105*

Chairs: Oxana Eschenko and Sara Mednick,
Tuebingen and Irvine (USA)

- 11:30 **Opening Remarks**
- 11:35 Artemis Gkinakou, Freising
UNRAVELLING THE ROLE OF SLEEP IN VOCAL
LEARNING (S35-1)
- 11:45 Oxana Eschenko, Tuebingen
THE ACTIVITY DYNAMICS OF THE LOCUS
COERULEUS NORADRENERGIC NEURONS
DURING SLEEP AND ITS ROLE IN SYSTEMS-
LEVEL MEMORY CONSOLIDATION (S35-2)
- 12:10 Anita Lüthi, Lausanne, Switzerland
LOCUS COERULEUS ACTIVITY FLUCTUATIONS
IN MOUSE NON-REM SLEEP: COORDINATORS
OF BRAIN AND PERIPHERAL RHYTHMS,
GATEKEEPERS OF THE NON-REM-REM SLEEP
CYCLE, CULPRITS OF SLEEP DISRUPTIONS
(S35-3)
- 12:35 Celia Kjærby, Copenhagen, Denmark
THE ROLE OF NOREPINEPHRINE-DRIVEN
SLEEP MICROSTRUCTURE ON COGNITIVE
PERFORMANCE IN HEALTH AND DISEASE (S35-4)
- 13:00 Sofie Smith Jacobsen, Copenhagen, Denmark //
Sara C. Mednick, Irvine, USA
OF MICE AND MEN: AUTONOMIC ACTIVITY
THAT SUPPORT MEMORY CONSOLIDATION
DURING SLEEP (S35-5)
- 13:25 **Concluding Remarks**