3rd Locus Coeruleus meeting

September 9th to 11th 2024

Innsbruck, Austria

Monday 9.9.2024

Opening: 9.00-9.30

9.30-10.00 Data blitz 1

Coffee break 10.00-10.30

10.30 – 11.45: Session 1: How do subcortical structures contribute to sleep?

1. **Bergamo, Damiana**; Handjaras, Giacomo; Picchioni, Dante; Ricciardi, Emiliano; Özbay, Pinar S.; de Zwart, Jacco A.; Duyn, Jeff; Bernardi, Giulio; Betta, Monica: Two slow-wave sub-types with distinctive morphological features are associated with specific sub-cortical sleep activation patterns: an EEG-fMRI investigation
2. **Sych, Yaroslav**; Campelo, Tiago; Gutierrez, Carolina; Helmchen, Fritjof; Adamantidis, Antoine: Reward experiences shape norepinephrine release during task-learning and consolidation during sleep
3. **Eschenko, Oxana**: The Locus Coeruleus - Noradrenergic activity during sleep and its role in memory function
4. **Anita Lüthi**: The locus coeruleus as a gatekeeper for the mammalian non-REM-REM sleep cycle: lessons from the mouse
5. Mortazavi, Nasrin; Talwar, Puneet; Koshmanova, Ekaterina; Sharifpour, Roya; Beckers, Elise; Campbell, Islay; Darbour, Ismael; Paparella, Ilenia; Balda Aizpurua, Fermin; Zubkov, Mikhail; Lamalle, Laurent; **Vandewalle, Gilles**: REM sleep quality is associated with balanced locus coeruleus response during wakefulness

Discussion 11.45-12.15

Greetings Dean Prof. Buchheim

Lunch 12.30-13.15

13.15 – 14.45 Session 2: What makes the LC vulnerable to neurodegeneration?

1. **Heidi Jacobs**: Locus coeruleus integrity as predictor of cortical tau pathology and Alzheimer's disease-related cognitive decline
2. **Morrow, Eric**: Loss of mitochondrial enzyme GPT2 causes early neurodegeneration in locus coeruleus

3. **Ehrenberg, Alexander James**: Mechanisms underlying selective vulnerability of the locus coeruleus
4. **Herms, Jochen**; Klaus, Carolin; Ochs, Katerina; Struebing, Felix; Feyen, Paul; Gentz, Johanna; Brendel, Matthias; Paeger, Lars: The impact of locus coeruleus vulnerability in early manifestations of Alzheimer's disease
5. **Miquel Vila**: Modelling human neuronal catecholaminergic pigmentation in rodents recapitulates age-related multisystem neurodegenerative deficits
6. Iannitelli, Alexa; Hassenein, Leslie; Tish, Margaret; Korukonda, Anu; Liles, L Cameron; Pare, Jean-Francois; Mulvey, Bernard; Dougherty, Joseph; Sloan, Steven; McKann, Katharine; Smith, Yoland; Beckstead, Michael; **Weinshenker, David**: Mechanisms underlying selective vulnerability of locus coeruleus neurons in Alzheimer's disease

Discussion 14.45-15.30

Coffee break 15.30-16.00

16.00 – 17.00 Session 3: What contributes to LC MRI contrasts?

1. **Zecca, Luigi**; Pezzoli, Gianni; Casella, Luigi; Capucciati, Andrea; Zucca, Fabio A: Neuromelanin, iron and copper in human locus coeruleus and substantia nigra
2. **Trujillo, Paula**: Bringing Neuromelanin-Sensitive MRI to Clinical Practice: Challenges and Considerations
3. **Kirilina, Evgeniya**, Büttner, Felix, Reinert, Tilo, Jäger, Carsten, Brammerloh, Malte, Morawski, Markus, Lipp, Ilona, Falkenberg, Gerald, Brückner, Dennis, Bazin, Pierre-Louis, Crockford, Catherine, Wittig, Roman, Weiskopf, Nik: Lifespan trajectory of dopaminergic neurons in substantia nigra
4. **Mather, Mara**: The two sides of the coin for locus coeruleus MRI contrast

Discussion 17.00-17.45

Dinner: 18.30-19.30

Tuesday 10.9.2024

9.00-10.45 Session 4: Altered and altering LC function in ageing and neurodegeneration

1. Kushwaha, Srishti; Roy Choudhury, Rupsa; Biswal, Jyotirmoy; **Karunakaran, Smitha**: Mapping the sex-dependent structural and functional alterations in the locus coeruleus-hippocampus communication in a soluble amyloid oligomer milieu
2. **Liu, Kathy Y**: Compensatory changes in locus coeruleus-dependent processes in agitation in Alzheimer’s disease
3. **David, Michael**; Mallas, Emma-Jane; Scott, Gregory; Karakoc, Hanim; Tsoi, Man Lai; Gruia, Dragos; Custovic, Darije; Wilson, Shaun; Li, Lucia; Malhotra, Paresh; Sharp, David: Simultaneous pupillometry and EEG during rest and task shows locus coeruleus dysfunction in Alzheimer's disease

4. **Ludwig, Mareike**, Hämmerer, Dorothea: Phasic taVNS: better memory performance and increased pupil dilation? The role of stimulation intensity and sensory perception
5. More, Kaushik; Gritskova, Aleksandra; Flautero, Andres; Gonzales-Cabrera, Cristian; Falkner, Annegret; **Prigge, Matthias:** Locus Coeruleus Neuronal Dynamics Under Transcutaneous Auricular Vagus Nerve Stimulation in Mice
6. **O'Callaghan, Claire**: Translating noradrenergic drugs to neurodegenerative diseases
7. **James Rowe**: LC and impulsivity: from population data to precision medicine

Discussion 10.45-11.15

Poster session: 11.15-12.30 - with coffee

Lunch 12.30-13.30

13.30-14.00 Data blitz 2

14.00–15.15 Session 5: Cognitive functions supported by the LC and changes in ageing

1. Zufiria, Blanca; Vereb, Daniel; Mijalkov, Mite; Sun, Jiawei; **Pereira, Joana B.**: Vulnerability of Locus Coeruleus Projections during Aging
2. **Hu, Xiaoping Philip**; Langley, Jason; Bennett, Ilana; Seitz, Aaron: MR Imaging of LC Integrity and Its Application in Studying Aging
3. **Chen, Hsiang-Yu**; Parent, Jourdan H.; Ciampa, Claire J.; Hooker, Jacob M.; Jagust, William J.; Berry, Anne S.: Catecholamine PET imaging of the locus coeruleus
4. **Dahl, Martin J.**; Li, Tiantian; Mather, Mara; Werkle-Bergner, Markus: Locus coeruleus-related insula activation supports implicit learning across the adult lifespan
5. **Rebecca Jordan:** The locus coeruleus as a global model failure system

Discussion 15.15-15.45

Coffee break 15.45-16.15

16.15 – 17.00 Session 6: Brain mapping

1. **Zerbi, Valerio**: Leveraging multimodal fMRI to study the complex interplay of LC, mental states and brain activity
2. **Bianciardi, Marta:** The Brainstem Navigator: a toolkit for brainstem nuclei atlasing and connectomics in living humans
3. **Alkemade, Anneke**: Mixed methodology to map the human subcortex

Discussion 17.00-17.30

Closing remarks 17.30-17.45

Leaving for Dinner at 18.00

Wednesday 11.9.2024

Methods chats: 9.30-12.00 (Two sessions in parallel) – with flexible coffee break

Session 1: Methods in animal research

Oxana Eschenko /Anita Lüthi: Sleep assessments

Animals: Yaroslav: All-optical optogenetic silencing of LC-NE neurons and norepinephrine recording in multiple brain regions

Matthias Prigge: Electrophysiological and optogenetic assessments

Session 2: Methods in human research

Max Dünnwald: How to generate automatic LC segmentations using Deep Learning

Yeo-Jin Yi: High precision coregistration and normalization of functional brainstem MRI data

Simone Cauzzo: The Brainstem Navigator Toolkit: coregistration tutorial, with a focus on functional MRI and cross-age translatability

Lunch 12.00-13.00

Contributions Data blitz 1: Monday 9.30 - 10.00

1. **Yokoi, Atsushi**; Kida, Ikuhiro: Evaluating the Integrity of the Locus Coeruleus using Ultra-High Field MRI and Its Relationship to Motor Learning Behavior
2. **Brodt, Svenja**; Klepel, Florentine; Erb, Michael; Scheffler, Klaus; Gais, Steffen: Imaging human LC activity during sleep with EEG-fMRI
3. **D'Agostini, Martina**; Dahl, Martin; Choi, Paul; Mather, Mara: Do inter-individual differences matter? Testing differences in locus coeruleus MRI contrast as a function of age, sex, body mass index, and self-identified race.
4. **Meissner, Sarah Nadine**; Weijs, Marieke Lieve; Potok-Szybinska, Weronika; Badii, Bianca; Kikkert, Sanne; Imhof, Jenny; Missura, Silvia; Bächinger, Marc; Raschle, Nora; Wenderoth, Nicole: Modulating arousal via pupil-based biofeedback: what we've learned so far
5. **Brammerloh, Malte**; Kirilina, Evgeniya; Alkemade, Anneke; Bazin, Pierre-Louis; Jantzen, Caroline; Schaumberg, Sara; Jäger, Carsten; Herrler, Andreas; Pine, Kerrin J.; Morawski, Markus; Forstmann, Birte U.; Weiskopf, Nikolaus: A neuroimaging nigrosome atlas based on multi-modal histochemistry

Contributions Data blitz 2, Tuesday 13.30-14.00

6. **Weijs, Marieke Lieve**; Missura, Silvia; Badii, Bianca; Carro Dominguez, Manuel; Kyle, Alan; Bächinger, Marc; Wenderoth, Nicole; Meissner, Sarah Nadine: Volitional control of pupil size via pupil-size biofeedback modulates cortical and cardiovascular arousal markers
7. **Dave, Arjun**; Ye, Shuer; Bätz, Leona Rahel; Jacobs, Heidi; Ziaei, Maryam: Age-Related Changes in Locus Coeruleus Activity During Ambiguity Processing
8. **Korukonda, Anuradha**; Atallah, Jake; Tish, Margaret; Pate, Brittany; Weinshenker, David: Behavioral and Molecular Consequences of Pathogenic Tau Expression in Mouse Locus Coeruleus
9. **Kelberman, Michael A**.; Winther, Kelly; Franks, Emily; Donaldson, Zoe: The impact of locus coeruleus lesions on pair bond dynamics and other phenotypes in monogamous prairie voles

Contributions Posters, Tuesday 11.15-12.30:

1. Marble, Harrison; **Li, Tiantian**; Nassar, Matthew: Arousal optimizes behavior by promoting latent state transitions
2. **Somervail, Richard**; Yang, Mingyu; Iannetti, Gian Domenico; Eschenko, Oxana: Surprising environmental stimuli and spontaneous LC bursts result in similar transient changes of the global brain state
3. **Mortazavi, Nasrin**; Talwar, Puneet; Koshmanova, Ekaterina; Sharifpour, Roya; Beckers, Elise; Berger, Alexandre; Campbell, Islay; Dardour, Ismael; Paparella, Ilenia; Balda Aizpurua, Fermin; Zubkov, Mikhail; Lamalle, Laurent; Vandewalle, Gilles: Locus coeruleus activity during wakefulness is associated with sigma power prior to REM sleep
4. **Novák, Csilla**: Examining accumulation rate of neuromelanin in the locus coeruleus as a critical factor for neurodegeneration
5. **Joshi, Ananya**; Novák, Csilla; Parker, Rafael; Prigge, Matthias: Linking Attentional States and Neuronal Dynamics in the Locus Coeruleus During a Decision-Making Task
6. **Barcellini, Francesca**; Molochidis, Nikolaos; Grimm, Christina; Zerbi, Valerio: LC-NA effect on brain dynamics in awake rat fMRI
7. **Tish, Margaret**; Birey, Fikri; Weinshenker, David: Creating human locus coeruleus organoids to study the role of the locus coeruleus in Alzheimer's disease
8. **Molochidis, Nikolaos**; Barcellini, Francesca; Grimm, Christina; Zerbi, Valerio: Deciphering the Role of Locus Coeruleus through Salient Stimulus Detection using functional MRI
9. **Pattanashetty, Swastik G**; Xie, Lei; Rockwell, Patricia; Serrano, Peter; Figueiredo-Pereira, Maria: Antagonizing LC-dependent noradrenergic system with Terazosin mitigates cognitive loss and pathology in an Alzheimer's rat model
10. **Patyczek, Agata**; Reinwarth, Elias; Gaebler, Michael; Villringer, Arno: Locus Coeruleus and Autonomic Cardiovascular Function
11. **Hassanein, Leslie Amina**; Weinshenker, David: Exploring Neuromelanin Accumulation in the Locus Corelulus: Implications for Early Alzheimer's Disease Pathology
12. **Zhunussova, Alina**; Loane, Clare; Kurt, Elif; Femminella, Grazia Daniela; Lenzoni, Sabrina; Duckett, Millie; Callaghan, Martina F; Weiskopf, Nikolaus; Dolan, Ray; Howard, Robert J; Düzel, Emrah; Hämmerer, Dorothea: Changes in task-evoked pupil dilation as a marker of locus coeruleus function in healthy aging and Alzheimer's disease
13. **Kakaei, Ehsan**; Schlecht, Anne; Kadri, Kenza; Hauser, Tobias U.: Baseline pupil size predicts use of information gain during exploration
14. **Brammerloh, Malte**; Sibgatulin, Renat; Herrmann, Karl-Heinz; Morawski, Markus; Reinert, Tilo; Jäger, Carsten; Müller, Roland; Falkenberg, Gerald; Brueckner, Dennis; Pine, Kerrin J.; Deistung, Andreas; Kiselev, Valerij G.; Reichenbach, Jürgen R.; Weiskopf, Nikolaus; Kirilina, Evgeniya: In situ magnetometry of iron in human dopaminergic neurons using super-resolution MRI and ion-beam microscopy

15. **Leiman, Marina**; Hämmerer, Dorothea: Exploring the Locus Coeruleus-Noradrenergic System: Impact of Trauma and Pharmacological Modulation in Healthy Aging
16. **Lenzoni, Sabrina**; Bergamo, Damiana; Betta, Monica; Mander, Bryce; Bernardi, Giulio; Hämmerer, Dorothea: Brainstem correlates of sleep impairments in aging: a simultaneous EEG-fMRI study protocol
17. **Penalba-Sánchez, Lucia**; Dünnwald, Max; Leiman, Marina; Hämmerer, Dorothea.: The Impact of Atomoxetine on the Noradrenergic System in Amnestic Mild Cognitive Impairment: an fMRI study
18. **Holzheimer, Lara**; Lancini, Elisa; García-García, Berta; Vockert, Niklas; Haag, Lena ; Panczyszyn, Joanna; Hämmerer, Dorothea; Düzel, Emrah; Penalba-Sánchez, Lucía: Relationship between Hippocampal Vascularization, Locus Coeruleus, and Cognition in Healthy Aging: a 3T MRI study
19. **Gurusamy, Guruprasath**; Dünnwald, Max; Schwarck, Svenja; Behrenbruch, Niklas; Schumann-Werner, Beate; Müller, Patrick; Molloy, Eóin N.; Büchel, Anna-Theresa; Fischer, Larissa; Hochkeppler, Anne; Garcia-Garcia, Berta; Incesoy, Enise I.; Kreissl, Michael; Düzel, Emrah; Maass, Anne; Hämmerer, Dorothea; Betts, Matthew: Neuromelanin-Derived Locus Coeruleus MRI Contrast is related to cognitive performance, hypertension and neurotrophic growth factors in older adults