Teachers: Ralf Schneggenburger and Olexiy Kochubey
TAs: Jinyun Wu, Runzhong (Yvonne) Zhang

Unit 3 – Nociceptive System and Nocifensive Behaviors

1) Read and discuss the paper:

Michael Chiang et al. 2020: **Divergent Neural Pathways Emanating from the Lateral Parabrachial Nucleus Mediate Distinct Components of the Pain Response.** Neuron 2020 106:927 (on Moodle)

please concentrate on Figures 1, 2, 3, 4.
plus parts of Supplementary Figures S1, S2, S3, S4
(A pdf file with these Figures can be found on moodle)

2) After reading the paper by Chiang et al., 2020 Neuron (see above), discuss the output pathways of the PBN to i) the BNST (bed nucleus of the stria terminalis) and CeA (central amygdala) and ii) to the PAG. Discuss the roles of these pathways in nocifensive behavior / learned behaviors after pain experience.

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Further questions related to general concepts of Nociception:

3) Which two kinds of sensations in the skin are processed by the Nociceptive system?

4) Explain the process of primary sensory transduction in the nociceptive system. Where does this process take place, and which ion channels are primarily involved? (make a drawing)

5) Via which two axon classes is nociceptive information transmitted towards the CNS?

6) Explain the principal anatomy of the nociceptive system, using the example of the Spino-thalamic pathway. Use the terms free nerve ending, dorsal root ganglion, sensory neuron, dorsal horn, secondary sensory neuron, anterolateral tract, and axon crossing in your explanation (make a drawing as well).

7) Name two examples for exogenous (or also synthetic) opiates. Then name two examples for "endogenous opiods". To which group of molecules do the latter belong?

8) On which types of receptors do opiates act, and to which sub-class of receptors do these belong? Which receptor subtype is the most relevant for the control of pain sensation?

9) Explain how the endogenous control system of pain sensation works, using the terms PAG (periaqueductal grey), rostroventral medulla (RVM), descending pathways, dorsal horn, endogeneous opioids.