２０２４年度　医学部共通講義Ⅲ
機能生物学入門

機能生物学セミナー

演題：　Neurocircuit Insights: How Sensory Feedback Shapes Motor Control and Adaptation　＊言語は英語です

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日時：　令和６年 11 月 11 日（月）14:55～16:40

場所：　医学部教育研究棟 13 階 第６セミナー室

要旨:

“It is like riding a bike”. This phrase refers to memory retention of a learned task in the absence of practice. It is clear from our everyday experience that the nervous system forms long-term motor memories. However, experimental demonstration of how motor memories are formed and retained remains elusive.

In the first half of the lecture, I will introduce a phenomenon in which the spinal cord learns and retains a learned behavior regulated by two inhibitory neuronal populations and mechanisms that control each phase of learning. Our findings suggest an experience-dependent shift in circuit engagement that generates identical behavior, where the spinal cord initially relies on somatosensory information to isolate rules for adapting motor output, while it engages motor output circuits directly upon learning.

In the second half, I will discuss the principle of motor adaptation, which is facilitated by comparing predictive feedforward signals to sensory inputs to update motor commands. This work highlights superior colliculus circuits linking visual input from the retina to brainstem nuclei, the Pontine Reticular Nucleus (PRN). Our anatomical tracing study reveals that the SC is in a prime position for integrating visual information and an efference copy of motor commands from the PRN. In support of this idea, chemogenetic silencing of SC-PRN projection neurons deteriorates reaching kinematics. Therefore, these findings suggest the SC serves as a critical contributor to optimizing motor performance by enabling the comparison between visual input and predictive feedforward signals to ensure precise reaching movement.

参考文献

- **Lavaud S, Bichara C, D’Andola M, Yeh S, Takeoka A (2024). Two inhibitory neuronal classes govern acquisition and recall of spinal sensorimotor adaptation. *Science 384,*194-201.**
- **Bertels H, Vicente-Ortiz G, El Kanbi K, Takeoka A (2022). Neurotransmitter phenotype switching by spinal excitatory interneurons regulates locomotor recovery after spinal cord injury. *Nature Neuroscience* 25 (5) 617–629.**
- **Takeoka A (2020). Proprioception: Bottom-up directive for motor recovery after spinal cord injury. *Neurosci Res* 154, 1-8. Invited review.**
- **Takeoka A and Arber S (2019). Functional local proprioceptive feedback circuits initiate and sustain locomotor recovery after spinal cord injury. *Cell Reports* 27 (1): 71–85.e3**

今年度の機能生物学セミナーは、対面形式で実施します。登録している博士課程の学生は出席で評価しますので、対面講義に出席して下さい。オンライン配信はありません。

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