Targeted recombination in active populations

C-fos is used to identify system-wide neural activation with cellular resolution in vivo. However, c-fos can only capture neural activation of one event. Targeted recombination in active populations (TRAP) allows the capture of two different c-fos activation patterns in the same animal. So far, TRAP has only been used to examine brain circuits.

A study of Pham et al. used TRAP to investigate spinal circuit activation during resting and stepping, giving novel insights of network activation during these events. The level of co-labeled (c-fos+ and TRAP+) neurons observed after performing two bouts of stepping suggests that there is a probabilistic-like phenomenon that can recruit many combinations of neural populations (synapses) when repetitively generating many step cycles. Between two 30-minute bouts of stepping, each consisting of thousands of steps, only ~20% of the neurons activated from the first bout of stepping were also activated by the second bout. We also show co-labeling of interneurons that have been active during stepping and resting. The use of the FosTRAP methodology in the spinal cord provides a new tool to compare the engagement of different populations of spinal interneurons in vivo under different motor tasks or under different conditions [1)].

1)
Pham BN, Luo J, Anand H, Kola O, Salcedo PL, Nguyen C, Gaunt S, Zhong H, Garfinkel A, Tillakaratne N, Edgerton VR. Redundancy and multi-functionality among spinal locomotor networks. J Neurophysiol. 2020 Sep 23. doi: 10.1152/jn.00338.2020. Epub ahead of print. PMID: 32966757.