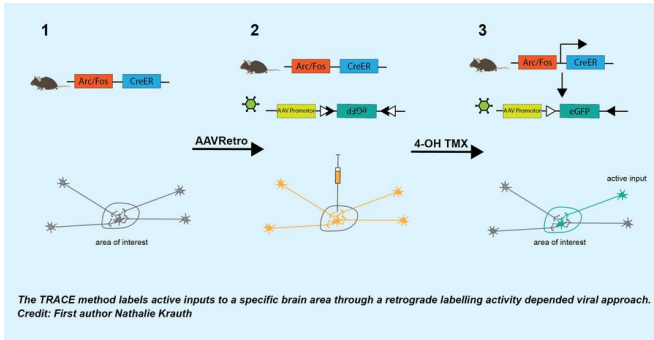


Method to identify neural inputs that convey information for defined behaviors

3 June 2020



The scheme shows the TRACE method that labels active inputs to a specific brain area through a retrograde labelling activity depended viral approach. Credit: Nathalie Krauth

A major interest in brain research is understanding behavioral experiences at the synaptic and circuit level. However, gaining insight into the neural circuits that underlie a specific behavioral experience is a challenge. The perplexity lies in defining which of the large number of neuronal inputs a specific region of the brain receives expresses a defined behavior, and yet there are no direct methods available to overcome this challenge.

Today, a common mapping approach in neuroscience is to use retrograde tracing viruses and identify all neuronal inputs in a population of neurons in a specific region of the brain. But neuroscientists are still left to rely on their experience, knowledge and previous findings to isolate specific inputs that underlie a defined behavior.

A collaborative study led by circuitry experts at the department of Molecular Biology and Genetics, department of Biomedicine and centre of Proteins in Memory unravel a new approach—an unbiased and accurate strategy that selectively tags arriving

inputs that are activated by a defined stimulus and projected to a particular brain region. The researchers developed an approach called TRACE by which a retrograde virus is combined with a Cre-recombinase that is under the control of an activity-dependent promoter to express a fluorescent marker in input neurons.

Using mouse models, the Nabavi and Capogna group have demonstrated the input specificity of their novel approach on four brain [circuits](#) receiving defined sensory inputs. Researchers performed behavioral testing using optogenetic stimulation, odor-driven innate fear detection and shock-induced circuit experiments. They also performed imaging of brain slices to investigate specific neural activity.

Their findings show that TRACE can identify active sensory neural inputs that underlie a defined behavior. This new labeling system is an additional tool to gain access to neurons in the [brain](#) that are activated by a particular stimulation or experience.

More information: Nathalie Krauth et al, TRACE: An Unbiased Method to Permanently Tag Transiently Activated Inputs, *Frontiers in Cellular Neuroscience* (2020). [DOI: 10.3389/fncel.2020.00114](#)

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