Newly generated nerve cells in dentate gyrus found to impact older nerve cells in two ways

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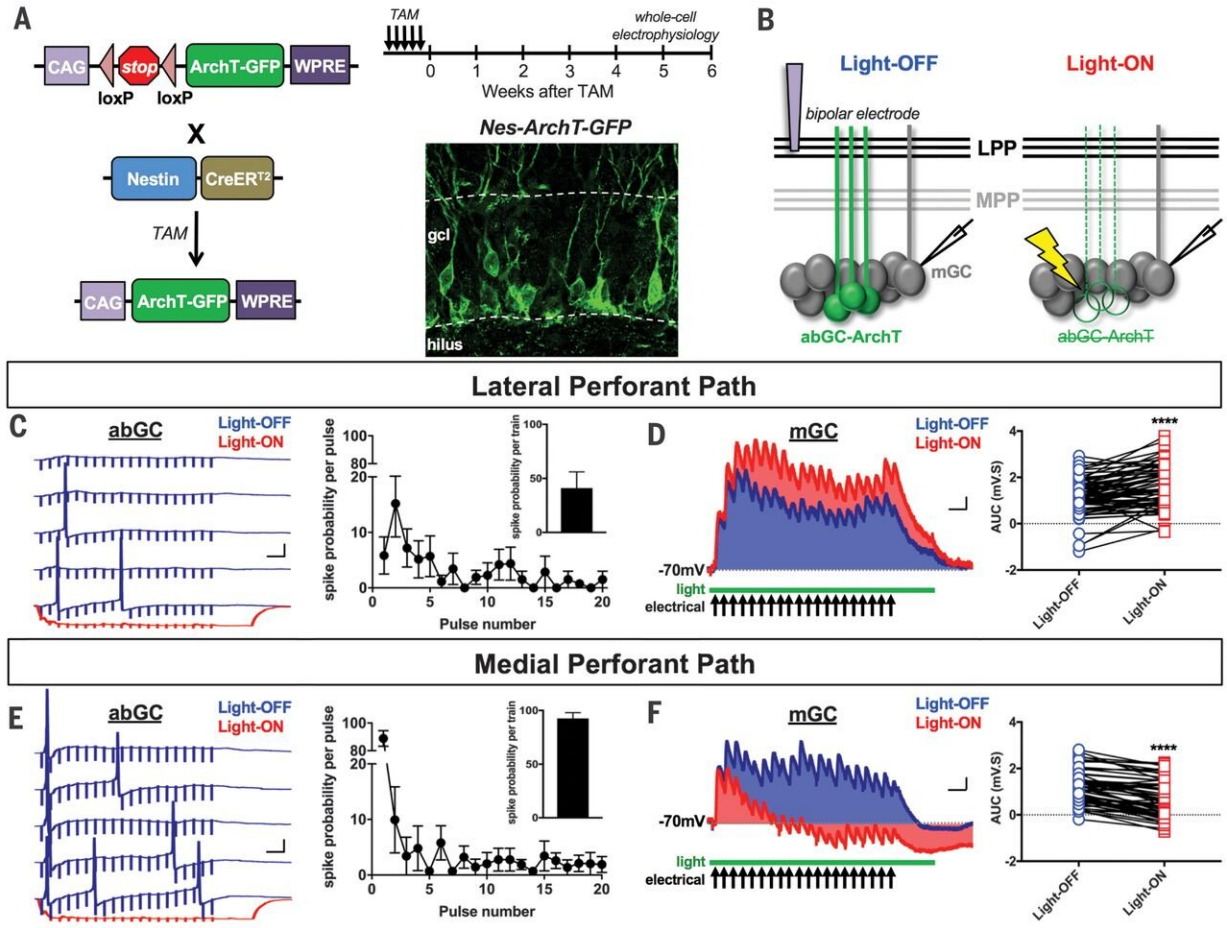

Bidirectional abGC-driven modulation of LPP- and MPP-evoked mGC responses. (A) Breeding strategy and TAM-induction schedule. Confocal image of abGCs in the DG of a Nes-ArchT-GFP mouse. gcl, granule cell layer; GFP, green fluorescent protein; WPRE, woodchuck hepatitis virus posttranscriptional regulatory element. (B) Experimental protocol: A bipolar stimulating electrode was positioned in the LPP or MPP. Whole-cell current clamp recordings were

performed on GCs before (Light-OFF) and during (Light-ON) optogenetic silencing of abGCs with a 532-nm green laser projected through a 40× objective. (C and E) (Left) Five traces from a representative abGC spiking in response to 40-Hz train stimulation. Stimulus artifacts show 20 pulses (0.1 ms) in each trial. Blue and red traces indicate spike activity during Light-OFF and Light-ON conditions, respectively. (Right) Average abGC spike probability for each pulse in the train. (Inset) Average abGC spike probability per train. Error bars indicate SEM. (D and F) (Left) Average evoked synaptic potentials in a representative mGC. Shaded blue (Light-OFF) and red (Light-ON) areas indicate AUC. AUC = area above baseline (depolarization) minus area below baseline (hyperpolarization). (Right) Plots comparing Light-OFF versus Light-ON AUCs for each mGC. Scale bars: 20 mV, 50 ms [(C) and (E)]; 0.5 mV, 50 ms [(D) and (F)]. Credit: *Science* (2019). DOI: 10.1126/science.aat8789

A team of researchers affiliated with several institutions in the U.S. reports that newly generated nerve cells in the brain's dentate gyrus impact older nerve cells in two ways. In their paper published in the journal *Science*, the group describes their study of neurogenesis in mouse models and what they learned from it. María Llorens-Martín, with Centro de Biología Molecular Severo Ochoa has published a Perspectives piece on the study in the same journal issue.

Neuroscientists have only recently found proof of neurogenesis in adult mammals, but are now forging ahead with studies designed to learn more about it. In this new effort, the researchers sought to learn more about the role of neurogenesis in memory and mood. To that end, they conducted multiple studies using transgenic mouse models via optogenetics and electrophysical recordings on different parts of the hippocampus. In so doing, they found that the behavior of mature neurons in the dentate gyrus is impacted by the behavior of newly generated neurons in the same vicinity. They also found that the behavior of the newly born neurons was seemingly controlled by signals

from the entorhinal cortex (located in the medial temporal lobe).

More specifically, the researchers found that newly generated neurons, which they refer to as adult-born granule cells (abGCs), behave in different ways depending on what signals they receive from one of two parts of the entorhinal cortex. If they receive a signal from the lateral entorhinal cortex, the researchers explain, then abGCs inhibit activity by the more mature neural cells in their vicinity. But if they receive signals from the medial entorhinal cortex, they do the opposite, exciting the older cells.

The researchers note their findings suggest that a function of abGCs appears to be regulation of entorhinal cortex cues—those from the lateral entorhinal cortex are known to be involved in processing contextual information, whereas those from the medial entorhinal cortex are known to be more involved in processing spatial information. Llorens-Martín suggests that learning more about how the process is fine-tuned should help in better understanding regulation of this ever-changing system.

More information: Victor M. Luna et al. Adult-born hippocampal neurons bidirectionally modulate entorhinal inputs into the dentate gyrus, *Science* (2019). DOI: 10.1126/science.aat8789