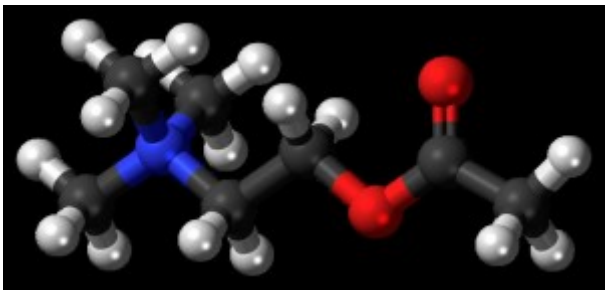
SCIENTIFIC AMERICAN™

Remember It Well: A New Type of On-Switch for Memory

By Gary Stix | November 2, 2012


Acetylcholine

Nicotine enhances the ability to focus and remember. The alkaloid acts in a similar manner to the brain's own signaling molecule, acetylcholine. It interacts with eponymous receptors on the surface of nerve cells to regulate signaling in the brain. (Note: eponym = a structure which is named after the person who discover the structure / therefore, a nicotine receptor is the receptor for nicotine which also is the receptor for acetylcholine.)

The role of the nicotinic-acetylcholine receptors throughout the central nervous system is so wide-ranging that new discoveries about the molecule continue apace. A recent study published in *Nature Neuroscience* found that one type of nicotinic receptor acts as a key element in a cell that appears to perform a critical function in regulating memory.
A team of researchers—led by one group from Uppsala University in Sweden and another from Rio Grande do Norte in Brazil—found that a type of nicotinic receptor on a cell called oriens lacunosum-moleculare (OLM-alpha 2) seems to be involved in turning on a critical circuit in the hippocampus, a brain structure involved with memory formation. "This cell has a significant influence on the incoming information to the hippocampus," says Klas Kullander from Uppsala University.

When this circuit is switched on, visual, auditory or other inputs to the hippocampus are targeted for additional processing of the incoming information, perhaps a means of flagging its importance so that it can be directed to the cerebral cortex for long-term storage of memory. The on-state of this circuit "prioritizes more intense local processing of the information," Kullander says. "It lets the hippocampus dwell on the information longer."

Future research will elucidate a more incisive picture of the function of OLM cells and will, as did the original study, *use a technique called optogenetics, which deploys light to switch on individual cells*. If additional research confirms the importance of OLM as a gatekeeper for memory, the receptors on the cell could become a possible drug target for

enhancing cognition in patients who suffer from neurodegenerative diseases or other illness.

About the Author: Gary Stix, a senior editor, commissions, writes, and edits features, news articles and Web blogs for SCIENTIFIC AMERICAN. His area of coverage is neuroscience. He also has frequently been the issue or section editor for special issues or reports on topics ranging from nanotechnology to obesity. He has worked for more than 20 years at SCIENTIFIC AMERICAN, following three years as a science journalist at IEEE Spectrum, the flagship publication for the Institute of Electrical and Electronics Engineers. He has an undergraduate degree in journalism from New York University. With his wife, Miriam Lacob, he wrote a general primer on technology called Who Gives a Gigabyte? Follow on Twitter @@gstix1.