Tracing the formation of long-term memory

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The formation of long-term memory in fruit flies can be demonstrated by the influx of calcium into cells called mushroom body neurons that occurs after special training that includes periods of rest, said researchers from Baylor College of Medicine (BCM) in a report that appears in the current issue of the journal *Neuron*.

"We have strong evidence that this is really a molecular change that is involved in long-term memory," said Dr. Ronald Davis, professor of molecular and cellular biology at BCM. "This appears to be an authentic memory trace for long-term memory."

Davis and his colleagues used spaced training to teach the flies to associate an odor with a mild electric shock. This method gives the fly a training trial, then a rest and then another trial. The rest is critical in inducing long-term memory that can last days. In this study, the five spaced trials produced a memory that lasted for more than a day. They then used a technique called "functional imaging" to see when the memory formed in the fly's brain.

"Before training, we could see some calcium flowing into the mushroom body neurons when the flies were exposed to odor," said Davis. When they exposed the fruit flies or Drosophila to the odor 24 hours after spaced training, they saw much more calcium flowing into the mushroom body neurons. The increased calcium influx paralleled the long-term memory of the flies. Using special laboratory techniques, he and others in the lab showed that they could block the calcium influx by blocking the function of a protein critical to making the new synapses

associated with long-term memory.

Source: Baylor College of Medicine