Aerobic exercise creates a muscle protein that boosts mouse memory

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Researchers from Seoul National University and the Korea Brain Research Institute have found that aerobic exercise can prompt mice to produce a protein that helps the brain consolidate short-term memories into long-term ones.

The researchers moved an individual mouse from its home cage to a 'shock cage', allowed it to habituate for 3 minutes, then subjected it to a two-second electric shock paired with a pulse of white noise. A minute later, the mouse was returned to the home cage. The next day, the mouse was again moved to the shock cage, habituated for 3 minutes, then only the noise pulse was given. Upon hearing it, in most instances, the mice froze as they associated the sound with the unpleasant memory of the shock.

Second, the researchers moved mice into a test cage with identical objects placed at two corners, allowing them 5 minutes to explore the objects. The next day, one object was replaced by another. The mice's ability to discriminate between the objects was assessed by the time the rodents spent exploring the new object. Third, mice were made to swim to a platform submerged in a tank filled with dyed water. A cognitively superior mouse took less time to recall the platform's location.

Previous research has shown mice love to play on a running wheel if one is available. So the researchers gave special mice access to a running wheel for four weeks. These mice had been genetically engineered for the scientists to easily track the proteins produced in their skeletal muscles. Based on tracking the protein and a revolution counter on the wheel, the team found that mice that exercised had higher cognitive performance than mice that hadn't received a wheel. When the team examined the mice's blood plasma and brains, they found higher levels of several proteins from the skeletal muscles compared to their sedentary littermates. The most prominent such protein was Serpinale.

Serpinale travels to the brain, where it enhances neurite formation in the hippocampus, which is responsible for consolidating long-term memories. An intravenous injection of Serpinale to sedentary mice also improved their cognitive performance.

The researchers wrote their "study focused on male animals to avoid any potential effects of sex-dependent physiological and behavioural variabilities" and that "future studies are warranted to consider comparative investigations of Serpinale-mediated cognitive modulation in both sexes."

(D.P. Kasbekar is a retired scientist)