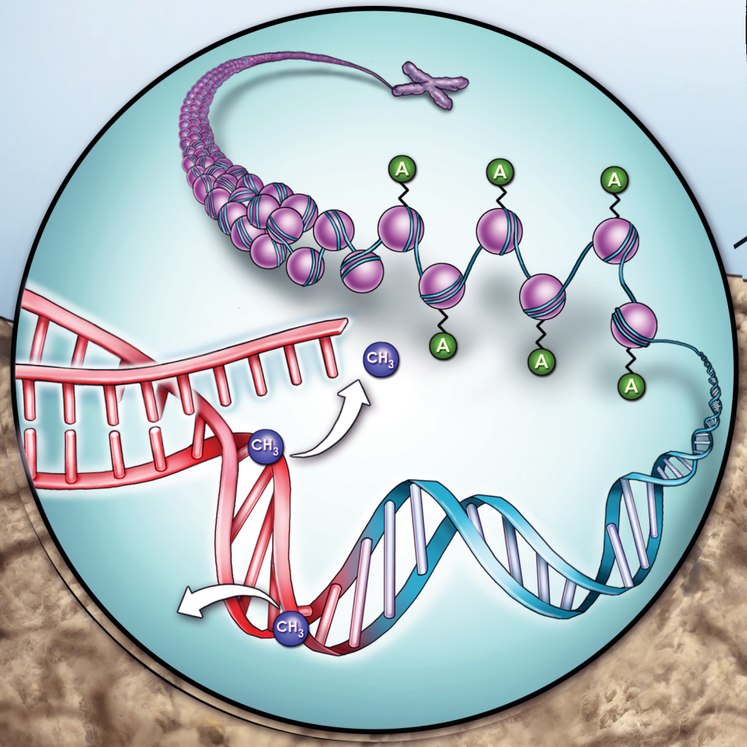
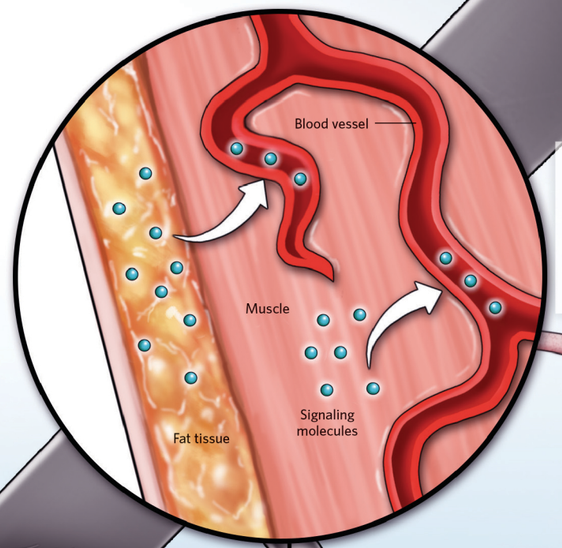
EXERCISE'S EFFECTS

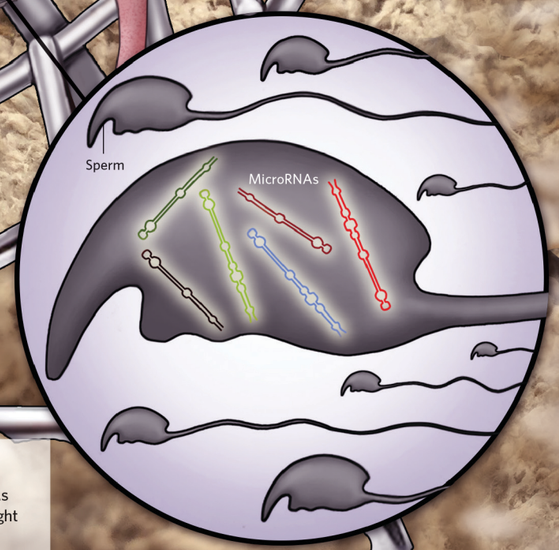
Physical activity increases the volume of the brain's hippocampus and improves learning and memory in mice and humans. Mouse studies have linked these effects to the growth and maturation of new neurons. Now, researchers are beginning to unravel the molecular mechanisms that connect exercise to these cognitive benefits.



BRAIN-DERIVED NEUROTROPHIC FACTOR
Exercise influences levels of neurotrophins, proteins that promote the proliferation of neurons and support their function. Physical activity enhances DNA demethylation in the promoter region of the *Bdnf* gene, increasing the expression of the neurogenesis-boosting signaling factor. Moreover, histone acetylation appears to loosen chromatin to bolster *Bdnf* transcription.



BLOOD SIGNALS
Exercise leads to the secretion of molecules by muscle and fat cells that affect levels of growth factors in the brain, influencing the shape and function of the hippocampus by accelerating new neuron growth and increasing the volume of the brain region.



SPERM
In the sperm of male mice that exercise, the abundance of certain microRNAs associated with learning and memory increases. The mice's offspring show slight cognitive advantages compared with offspring of sedentary mice.