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Brain cell growth diminishes long before old age strikes, animal study shows

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Even early in adulthood, aging begins to slow the mind's growth -- but it does not have to stop it altogether, suggests a Princeton University study on the brains of adult monkeys.

A team of neuroscientists has found that soon after marmoset monkeys reach adulthood, the rate at which new neural cells form in the hippocampus region of the animals' brains begins to decline. The hippocampus is associated with both learning and memory. While other research groups have made similar observations in the brains of rodents, this is the first time the decrease in new cell growth, known as neurogenesis, has been noted in a primate, the biological order that also includes apes and humans.

That the hippocampus shows such a decrease in neurogenesis long before the onset of old age would appear at first to be utterly bad news for the mind. However, team member Elizabeth Gould said the findings nevertheless were encouraging for several reasons, including the implication that researchers might one day find ways of stimulating the human brain to generate neural cells more rapidly at any point in life.

"Past theories have suggested that complex brains, like those in monkeys and humans, undergo no changes in brain structure once adulthood is reached," said Gould, a professor of psychology and co-director of the Program in Neuroscience. "These new findings, however, offer further evidence that the primate brain actually shows a remarkable amount of structural reorganization over time. It declines with age, but it does

persist at a lower level. Whatever stimulates these changes can most likely be tapped into and enhanced."

Marmosets, which are found in Central and South America, reach sexual maturity around the age of 18 months, and commonly begin showing the telltale signs of old age -- such as dementia and arthritis -- around the age of 8 years. Gould's team examined the neural cell growth in 17 marmosets of both genders, all of which were between 18 months and 7 years of age. The team found that the younger adults still showed vigorous new cell growth in the hippocampus. But the older the monkey was, the fewer new brain cells had appeared.

"This news isn't entirely negative, though it seems to be at first glance," Gould said. "The silver lining here is that neurogenesis continues long past puberty and does not stop entirely, even in older primates. What's more, it can be stimulated with experience."

For rodents, some of the ways adult neurogenesis can be stimulated are well known: allowing rats to socialize and exercise encourages their neural growth. Researchers believe these methods will work also in primates. One reason why other scientists will find this new study useful, Gould said, is because the discovery adds to the list of changes that have been noted in the brains of both primates and rodents -- the latter of which are the most commonly used creatures in neuroscience experiments.

"This means we can be confident that what we discover about the rodent brain can be applied to primates," she said. "We'd like to do more studies to see if we can find out first what maintains the higher level of neurogenesis in young animals, and then how we can keep it going at that level as the brain ages."

Though Gould cautioned that it would be premature to draw too many

hard and fast conclusions about the human brain as a result of the findings, she said the study suggests that methods of maintaining the mind's flexibility do exist.

"Someday we hope this kind of research will help us discover what keeps brain cells growing, so we can both keep our minds vibrant and help people with neurodegenerative illnesses," Gould said. "In the meantime, it's safe to say that staying physically active and providing new experiences for your mind will not hurt. The brain doesn't have to stop growing. It's not over till the last neuron dies."

Source: Princeton University