Of Mice and Marathon Men

Animal studies show how exercise protects brain cells from disease

BY LINDA CARROLL

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At a research lab in Tennessee, mice stave off the rodent version of Parkinson's disease simply by scampering through the night on exercise wheels.

Across the country at a lab in California, running rodents have shown that Alzheimer's disease and amyotrophic lateral sclerosis (ALS) can be slowed with vigorous exercise.

The new animal research is helping scientists begin to unravel some intriguing results from recent human population studies. A 2005 report showed that men who exercised vigorously in their youth reduced the risk of Parkinson's by 60 percent. And a 2006 report found that seniors who exercised at least three times a week were 60 percent less likely than their sedentary counterparts to develop dementia during the six-year study.

Vigorous **aerobic exercise** may help stave off degenerative neurological disorders.

And now, exercise has been shown to preserve brain cells in animal models of Alzheimer's, Parkinson's, Huntington's, and ALS, says Fred H. Gage, Ph.D., a professor in the Laboratory of Genetics at the Salk Institute in La Jolla, Calif. Further, working out appears to spark the birth of new cells in certain areas of the brain, he says.

To learn whether—and how—exercise might be protecting brain cells, researchers like Dr. Gage turned to animal models of various neurodegenerative diseases.

For example, to study Parkinson's disease, researchers focused on a type of mouse that would develop a Parkinson's-like syndrome when injected with a chemical substance called MPTP. That substance also can cause Parkinson's symptoms in human beings almost overnight.

Normally, within seven days of an MPTP injection, a mouse loses 40 percent to 60 percent of its brain cells in the exact same area as do human beings with Parkinson's, says Richard Smeyne, Ph.D., a neurobiologist at St. Jude Children's Research Hospital in Memphis, Tenn.

But, when Dr. Smeyne gave his mice access to an exercise wheel for three months before the injection, an amazing thing happened: The MPTP didn't kill any brain cells.

There was one small problem, Dr. Smeyne says. The mice, apparently addicted to running, kept spinning the wheels all night long. And considering the shortness of their legs, the distance the mice covered overnight was comparable to a human running a marathon.

Dr. Smeyne wondered whether the animals could get away with less exercise. So, he performed the same experiment allowing some of the mice access to the exercise wheel for a third of the night while the rest got to run twice as long. Mice that ran the shorter distance experienced only a 10 percent reduction in MPTP effects while their long-running counterparts had a 70 percent reduction, he reported this October at the annual meeting of the Society for Neuroscience.

It's not yet clear how these results apply to people.

"Nobody really knows how much exercise you need to do," Dr. Gage says. "This is all pretty new."

One thing to keep in mind, he says, is that running on a mouse wheel isn't the same as running out on the street. There's no friction, so the running doesn't take much effort, he explains. It's more comparable to covering the miles on a bicycle set on the lowest—and easiest—gear.

So, Dr. Gage says, it may turn out that marathons aren't necessary to protect brain cells—just regular vigorous exercise. NN