Brain booster built for two

In 2003, Jay Alberts, PhD, rode a tandem bike across Iowa with Parkinson's patient Cathy Frazier to raise awareness and money. After countless pedal pushes and a few serendipitous strokes of handwriting, the trip would yield even bigger results.

When Ms. Frazier signed a birthday card for a friend during the trip, Dr. Alberts noticed that her writing was clear and neat, unusual for patients with the brain disorder. In fact, all of her motor skills seemed to improve. In 2006, another ride with a different patient produced similar observations, including a decrease in tremor.

"After seeing that, I knew I had to follow up with a real preliminary study," says Dr. Alberts, Assistant Staff in Biomedical Engineering at the Lerner Research Institute.

In that study, published in April 2009 in Neurorehabilitation and Neural Repair, five patients rode with a trainer on a stationary tandem bike, and five rode solo for an eight-week training period. The patients in tandem experienced a 35 percent improvement in motor skills and upper extremity function, far better than the soloists. Those improvements were still evident four weeks after they stopped pedaling.

"To me, this points to a real change in central nervous system function," Dr. Alberts says. He theorizes that "forced exercise" — so called because tandem riding helps the patients pedal much faster than they could on their own — improves the flow of signals from the brain to the rest of the body. Now, Dr. Alberts and colleagues are using functional MRI imaging to observe those changes as patients cycle.

They also are developing a motor-driven cycle so future test participants — and, possibly, future patients — can achieve the same benefits when riding solo. — Chris Blose

PINPOINTING NEW IMMUNE DISEASE

When siblings are born with the same disease, chances are good they inherited it from their parents. But finding the cause, a faulty gene passed from generation to generation, can be daunting.

In 1996, Lerner Research Institute scientist Tatiana Byzova, PhD, learned of a brother and sister who had severe bleeding, frequent infections and other immune problems. "It was nothing like any other disease," Dr. Byzova recalls. She suspected it was a new genetic disease.

Genetic diseases are caused by changes in the letter code, or sequence, of genes. Such changes garble the instructions for producing proteins. So Dr. Byzova and her colleagues began a painstaking 12-year analysis of the proteins in the two siblings' blood cells to search for abnormalities.

They found one: KINDLIN-3. This protein allows cells to communicate and carry out normal functions, such as fighting off infections.

The gene that encodes the KINDLIN-3 protein had a tiny change in its sequence. The siblings had inherited two faulty copies, one from each parent. Thus, they could not produce any normal KINDLIN-3. The researchers published their findings in the March 2009 issue of Nature Medicine.

Dr. Byzova and colleagues have devised a genetic test for the gene mutation so that doctors can diagnose the disease. "There are probably many more patients with this disease," she says. With an accurate diagnosis in hand, doctors will be able to choose the right treatment: a bone marrow transplant. The two siblings were given bone marrow transplants, and both are now fine.

— Laura Bonetta