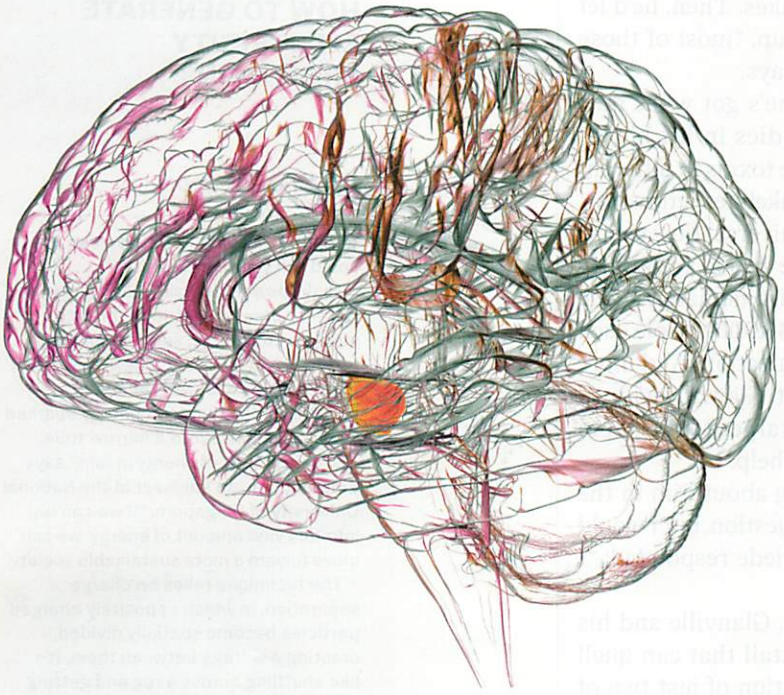

NEUROSCIENCE

Stem cell treatments show promise for Parkinson's

By Laura Sanders

● **Two small clinical** trials revive hope for an old idea: Cells injected into the brain might replace the nerve cells that die in Parkinson's disease. The studies, published in *Nature*, represent early steps for stem cell therapies that aim to replace these dead cells in the brain — and stop Parkinson's and the movement problems, tremors and rigidity that it brings.

In both trials, scientists injected cells derived from stem cells that would go on to become specialized neurons that pump out the chemical messenger dopamine. These are the crucial cells in the brain that die in Parkinson's disease, a relentless neurological disease that is estimated to affect more than 8 million people worldwide.

Together, the results "mark an encouraging first step in stem cell–based therapy for Parkinson's disease," says neurologist Ole Isacson of Harvard Medical School and McLean Hospital in Belmont, Mass.

This isn't a new idea. Decades ago, scientists attempted to replace these missing cells with transplants of fetal brain tissue. The attempts were beset with problems and ethical objections, and ultimately didn't work. But some patients did improve. "There have been times of hype versus hope," says Viviane Tabar, a neurosurgeon and stem cell biologist at Memorial Sloan Kettering Cancer Center in New York City and coauthor of one of the new studies. The current findings point toward hope, she says.

Both of the new studies were small: 12 patients in Tabar's study and seven in the other. These trials were designed to test whether injections of cells derived from stem cells — from fetal tissue in Tabar's study and adult blood cells in the other — are safe. Those earlier studies on fetal brain tissue left some of the volunteers with movement problems that were distinct from those caused by Parkinson's, Tabar says. Other worries included bleeding from where the tube full of cells enters the brain and uncontrolled growth of these added cells, a scenario that could lead to tumors.

None of these scenarios happened. "We confirmed the safety," says neurosurgeon and researcher Jun Takahashi of Kyoto University in Japan, who is a coauthor of the other study.

In both studies, some participants experienced negative events that may have been related to the immune-suppressing drugs they

↖ In Parkinson's disease, nerve cells in the brain's substantia nigra (orange region in this illustration) become impaired or die. New trials suggest stem cells could replace those cells.

KATERYNA KON/SCIENCE PHOTO LIBRARY/GETTY IMAGES

needed to take with foreign cells. Other scientists, including Isacson, get around the need for these drugs by using stem cells made from a person's own cells. Using familiar cells for the starting material may be more time consuming and more variable, Tabar says. But, Isacson notes, cells derived from the person they're meant to treat "may offer additional advantages." Isacson holds patents and licenses for possible therapies that use a patient's own cells.

The new studies weren't designed to test whether added dopamine-producing cells improved symptoms. But there were hints that the cells did help, at least for some people. "It's early days, but it gives us optimism that the treatment may really enhance quality of life for these patients," Tabar says.

Similarly, Takahashi and colleagues saw signs of dopamine being produced in the brains of study participants and symptoms improving for some of the volunteers, suggesting that this approach could be effective. But scientists won't know without larger studies.

Those studies are coming. Later this year, scientists will begin a larger trial with about 100 people using the same cells Tabar used. Tabar has financial interests in BlueRock Therapeutics, the cell therapy company that sponsored the current Phase I clinical trial that she worked on and will also sponsor the larger trial. That study will be double-blind, meaning neither the patients nor the clinicians examining them will know who received cells and who received a sham surgical incision.

Takahashi and colleagues are also collaborating with a pharmaceutical company on a possible clinical trial, he says. ✖

CHEMISTRY

SCIENTISTS HUNT FOR 'FOREVER CHEMICAL' REPLACEMENTS

BY SKYLER WARE

Harmful and persistent "forever chemicals" build up in the environment and in the bodies of animals, including humans. But a new review article lays out a blueprint for replacing those chemicals in certain situations.

A research team has compiled more than a decade of work from multiple labs to detail chemical principles of per- and polyfluoroalkyl substances, otherwise known as PFAS. PFAS show up in products as varied as firefighting foams, nonstick cookware and stain-resistant fabrics. While none of the proposed substitutes outperform existing PFAS yet, the best alternatives approach the same performance in certain water-repelling applications, scientists report in the *Journal of Colloid and Interface Science*.

PFAS usually contain long chains of carbon atoms. Depending on the chemical, most or all of the carbon atoms have strong bonds to one or more fluorine atoms. Mixed with water, some PFAS act as surfactants, which cause water droplets to spread out rather than bead up, even in the presence of oily chemicals where water normally wouldn't mix. This behavior relies on properties known as surface energy and surface tension. Molecules in a material with low surface energy or surface tension don't mind being at the surface of a solid or a droplet of liquid. PFAS surfactants lower the surface tension of water, so they excel in applications like foams that fight gasoline or grease fires.

When used as solid coatings, PFAS force liquids on a surface to bead up into droplets rather than spread out, which gives PFAS-coated materials like nonstick pans their water- and oil-repelling properties.

The strong carbon-fluorine bonds in PFAS don't break down easily, says Julian Eastoe, an interface scientist at the University of Bristol in England. Therefore, the chemicals accumulate in the environment and in our bodies, a buildup that "can be considered as one of the great ticking time bombs in our civilization," Eastoe says. PFAS have been linked to a range of health issues, from high cholesterol to cancer. Some researchers are investigating how to break CONT. ON PAGE 18