necessary, are less dependent on oxygen.

Even before that happens, researchers are eager to test the new timer protein. Leonard Zon of Children's Hospital and Harvard Medical School in Boston is using it to follow the development of blood cells in zebrafish. And many others are lining up after him. "The people [who] would like to use it are more than I can actually handle," says Terskikh, who is already involved in several collaborations. **–MARINA CHICUREL**

Marina Chicurel is a freelance writer in Santa Cruz, California.

NEUROSCIENCE

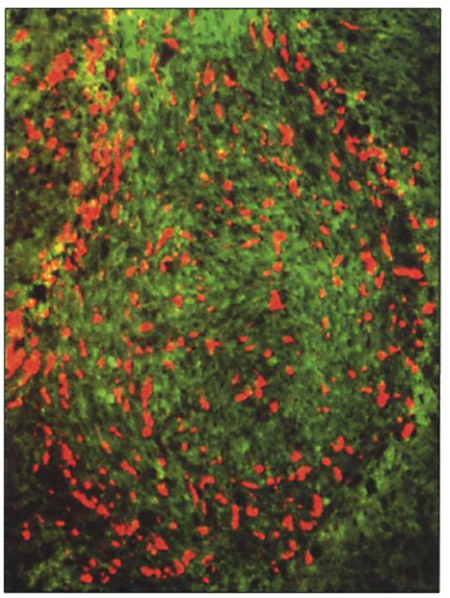
Stem Cells Hear Call of Injured Tissue

NEW ORLEANS—Like a superhero who can hear cries for help from miles away, ever versatile stem cells somehow sense danger in the brain and spinal cord and rush to the rescue. In animal models, at least, injected stem cells travel to tissue injured by stroke, Alzheimer's-like plaques, contusions, or spinal cord bruises, sometimes traversing long distances. Several teams reported these surprising results this month at the Society for Neuroscience annual meeting. No one knows exactly how stem cells detect these different kinds of damage, but researchers hope that the cells' migratory powers can be harnessed to either replace dead tissue or deliver therapeutics right where they're needed.

Researchers have known for years that stem cells migrate widely if added to young brains but are fairly dormant in healthy adult brains. Now studies are showing that injuries somehow prompt stem cell movement even in adult brains. "In the abnormal brain, there are new rules. The whole terrain is changed," says neuroscientist Evan Snyder of Harvard Medical School in Boston. And this newfound motility is being put to use: "A number of us find that we can pull cells out from the nervous system, grow them in a dish, and put them back," where they migrate to damaged tissue and sometimes repair it, Snyder says.

The research teams are using a variety of sources for their stem cells. Some come from established cell lines that originated either from human or mouse cells. Other researchers pluck neural precursor cells from where they occur naturally in the primate brain, in a layer of tissue that surrounds the ventricles. Others implant stem cells from embryonic tissue. Regardless of their origin, the cells share one trait: They still have developmental decisions to make. And under the right circumstances, they can be coaxed to turn into neurons or other brain cells called glial cells.

In many disorders that strike the motor system, replacing glial cells might be a better strategy than building new neurons, says neuroscientist Jeffery Kocsis of Yale University. Most spinal cord injuries, for instance, don't completely cut the axons that run through the cord. But bruising or crushing the cord kills the tissue, called myelin, that insulates the axons, leaving axons exposed and unable to conduct signals. To see whether stem cells could act as glial cells and build up myelin around bare axons, Kocsis and his team made small, demyelinating lesions in the spinal cords of monkeys. Using punch biopsy, they then plucked neural precursor cells from the rim of the injured monkeys' ventricles, multiplied them, and injected the cells back near the injury. The cells appeared to seek out damaged axons and rewrap them with myelin. Kocsis's team is now testing whether the newly insulated neurons conduct nerve impulses better than untreated ones. "The feasibility is there" for remyelinating exposed axons, Kocsis says, a strategy that could also be useful in treating multiple sclerosis.



To the rescue. Stem cells (red) infiltrate a brain tumor (green).

CREDIT: EVAN SNYDER/HARVARD UNIVERSITY

In another model of motor system damage, Jeffrey Rothstein of Johns Hopkins University and colleagues found that stem cells can migrate along the entire length of the spinal cord, at least in mice and rats. The team infected the animals with a virus that causes the same sort of neuronal damage as amyotrophic lateral sclerosis does in humans. The virus kills neurons at the base of the spinal cord, paralyzing the animal. When the Hopkins team injected mouse neural stem cells into the cerebrospinal fluid, the cells migrated from the top of the spinal cord to the base and clung to injured areas. Untreated control animals remained fully paralyzed. But 8 weeks after receiving the stem cells, half of the treated rats could move their limbs somewhat. Human-derived stem cells didn't work reliably, Rothstein says; they're not sure why.

Stem cells can also find their way to damaged spots in the brain. To model Alzheimer's disease, researchers led by Barbara Tate of Children's Hospital in Boston injected amyloid, a protein that accumulates into plaques characteristic of Alzheimer's, into one side of rats' brains. In control rats, they injected benign proteins. The researchers then injected stem cells into a ventricle on the opposite side of the brain. The cells crossed to the opposite hemisphere and found their way to the amyloid deposits but ignored the control protein.

Stem cells don't always make the cross-hemisphere trek successfully. In a model of traumatic brain injury in mice, stem cells injected near the injury migrated to it, as well as to diffuse white-matter damage throughout the injured hemisphere, reported Tracy McIntosh of the University of Pennsylvania in Philadelphia. There, they apparently repaired at least some of the damage: 12 weeks later, treated mice were walking relatively gracefully across a moving cylinder while the others stumbled about. But when the team injected stem cells into the opposite hemisphere, the cells did not find the injury or help recovery.

Looking at a different axis, Snyder's team has found that stem cells do move reliably from the back of the brain to the front. They injected stem cells into the rear brains of adult rats with induced strokes in the forebrains. The cells found their target, coating the rim of the stroke lesion and restoring some movement. But many questions remain, says Snyder. They don't know whether the stem cells replace dead cells near the lesion, improve connections among remaining cells, or perform some other function.

Stem cells might also be enlisted to deliver therapeutics to the right spot, according to a report in the 7 November *Proceedings of the National Academy of Sciences.* Brain tumors send tentacles throughout large areas of tissue, making tumors tough to eradicate. Karen Aboody of Children's Hospital in Boston, working with Snyder and colleagues, inserted into stem cells a gene for a molecule that shrinks tumors. They then injected the cells into several sites in rat brains. The stem cells surrounded the tumors and "chased down" the cancer cells the tumor spins off, they report, thereby shrinking the animal's tumor burden.

These studies, especially Aboody's, "show in a clinical context that we might be able to use this ability" of stem cells to migrate, says Ron McKay of the National

Institute of Neurological Disorders and Stroke. The next trick will be figuring out how stem cells know where to go. Damaged tissue must send out long-range signals, McKay says, and researchers are already on the lookout for them.

–LAURA HELMUTH

MATERIALS SCIENCE

Armenia Wants Second Mideast Synchrotron

BERN, SWITZERLAND—You might call it a case of open SESAME: Middle Eastern scientists who for years have been yearning for a synchrotron may wind up with two.

SESAME (Synchrotron Radiation for Experimental Science and Applications in the Middle East) is an 11-nation consortium formed to install and operate a first-generation synchrotron now mothballed in Germany (*Science*, 25 June 1999, p. 2077). Last spring, SESAME selected Jordan as the site of the 0.8 giga-electron-volt (GeV) BESSY-I synchrotron, disappointing Armenian officials who had hoped to snare the prize. But their dejection didn't last long. This month Armenia moved to the head of the line for a second, brand-new synchrotron after securing a $15 million down payment from the U.S. Congress as part of a foreign-aid spending bill that would funnel $90 million to the country.

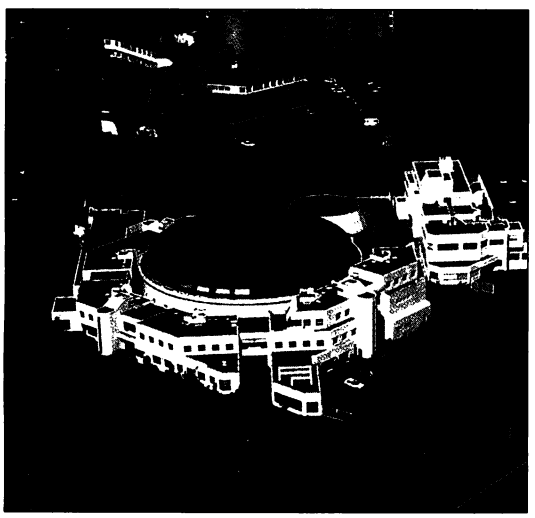
Armenia's latest strategy came as a surprise to SESAME, says Herwig Schopper, the former director-general of CERN, the European particle physics laboratory near Geneva, who heads SESAME's interim council, which met earlier this month in Yerevan, Armenia. The country's representatives say they hope to raise another $15 million from wealthy Armenian-Americans, as well as support from the Armenian government to operate the machine.

Schopper says the Armenian plan is feasible as long as enough money and users can be found for the synchrotrons, both of which would be managed by SESAME. Researchers may be attracted by its power (2 to 3 GeV), which would put it in a class with the new ANKA synchrotron in Karlsruhe, Germany. That's more powerful than Germany's BESSY instrument even after a planned upgrade (to fewer than 2 GeV). The Armenian instrument also might be more convenient for scientists in nations such as Pakistan or Iran.

SESAME has asked its oversight panels to canvass for users and provide advice for the Armenian proposal. The previously approved Jordan project, meanwhile, still needs to raise about $6 million to upgrade BESSY and $8 million or more to equip a site near Amman. Schopper expects key decisions on both projects to be made at the council's next meeting, scheduled for March in Cairo. "If we're fortunate, we'll get two instruments," says Schopper. "But we're confident we'll get at least one."

–ROBERT KOENIG

CREDITS: (TOP TO BOTTOM) PAUL SAKUMA/AP; BESSY



SESAME places. A Middle East consortium called SESAME hopes to run both Germany's old BESSY-I synchrotron (above) in Jordan and a second, more powerful machine in Armenia.

PHILANTHROPY

Moore Foundation Targets Science

Moore's Law now applies to philanthropy as well as computing power. Last week, computer industry titan Gordon Moore and his wife, Betty, announced that they are creating a $5-billion-plus foundation to support scientific research, conservation, and higher education. Once fully funded within a few years, the foundation is expected to rank among the dozen largest charities based in the United States.

Computer engineer Moore, the 70-year-old co-founder of processing-chip giant Intel Corp., is widely known for his observation that innovations were doubling computer processing power every 18 to 24 months. Moore's Law became a buzzword in the booming computer industry and helped to boost Moore's net worth to nearly $15 billion, mostly in Intel shares.

Now, the Moores want to share their new-economy wealth with researchers, university educators, and environmentalists. "Gordon is fairly passionate about looking for higher risk [research] projects that would not normally be funded by the National Science Foundation or the National Institutes of Health," says Lewis Coleman, who will become president of the San Francisco, California–based foundation early next year. He is currently chair of Banc of America Investment Services Inc.

High-tech donor. This Stanford laboratory is one of many gifts to science from Gordon Moore and his wife.

The charity's agenda will be shaped over the next year as Coleman hires dozens of staff members, recruits board members, and picks the brains of advisers. "We've just started to seek advice from the scientific community," he says. But basic and applied environmental studies and the physical sciences are among the "underserved" areas likely to benefit. Science "that would have an impact on protecting the environment [will be] an important, but not exclusive," focus of the foundation, he adds.

The Moores have already made an international mark in science philanthropy. They have given millions to the California Institute of Technology in Pasadena, California, $35 million for biodiversity protection to Conservation International, and $17 million to Cambridge University in the United Kingdom for a state-of-the-art physical sciences library and have built laboratories at Stanford University and the University of California (UC), Berkeley. Moore has also supported SETI, the Search for Extraterrestrial Intelligence, and a UC field research station on Moorea, a Pacific island next to Tahiti.

"Gordon Moore has impeccable taste and judgment when it comes to donating money—he could set the pace for other funders in a number of areas," says one former university administrator who has worked on securing gifts from the executive. "But it may be harder than he expects to find the niches where the foundation can make a clear-cut difference."

Still, Coleman is confident that the new Moore Foundation will have an impact. "We are open to joint ventures," he says, "and intrigued by [their] ability to bulk up and have influence on specific issues."

–DAVID MALAKOFF