

New Source for ‘Miracles’

Does the reality of amniotic stem cells live up to the promise?

BY KURT SAMSON

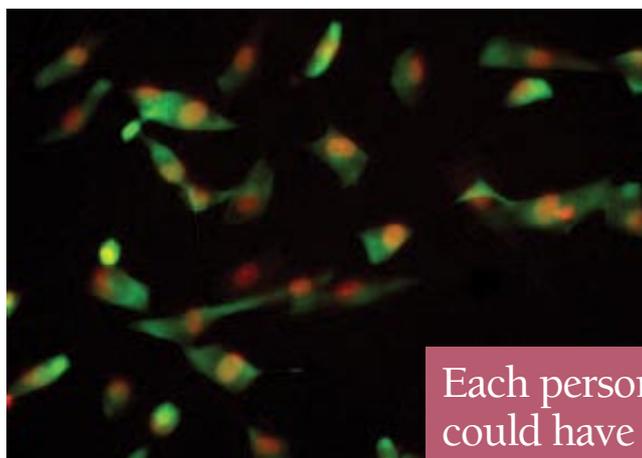
When researchers first discovered that certain cells in new embryos could be extracted and grown into different cell types in the laboratory—like “starter” seeds on a cellular level—there seemed no stopping the march toward medical miracles.

Using unwanted embryos destined to be destroyed by fertility clinics, scientists quickly demonstrated that the cells could generate brain, liver, heart, bone, and other cells, offering the dizzying possibility of a potentially unlimited source of replacement cells for treating diseases of the brain and nervous system. Parkinson’s and Alzheimer’s disease, amyotrophic lateral sclerosis, stroke, brain injury, and paralysis were immediately seen as potential targets for experimental therapies.

Embryonic stem cells replicate indefinitely but can be manipulated or “coaxed” into specific types of cells. Because they grow so vigorously, stem cell lines derived from a few embryos could potentially be used in hundreds of experiments to find new treatments.

But using cells from unwanted and discarded human embryos and fetuses has been controversial, prompting an outcry from pro-life advocates and their representatives in Congress. In 2001, President George W. Bush banned federal funding of any research using new embryonic stem cell lines derived from embryos, regardless of their origin.

Now scientists may have discovered an alternative source. In early January researchers at Wake Forest and Harvard Universities reported that cells retrieved from amniotic fluid could be cultivated into stem cells in the laboratory and grown into any of the major cell types, including



Each person could have a lifetime of “replacement cells” to treat neurological diseases.

brain and nerve cells.

Amniotic fluid surrounds and protects the embryo in the womb, and as a fetus grows, it sheds a tiny number of the promising cells into the fluid. Cells from amniotic fluid are extracted by needle using a technique called amniocentesis, the same procedure routinely used for prenatal testing. Similar cells have also been isolated from afterbirth—the placenta and other membranes expelled by the mother after a baby is delivered.

“We’ve known for decades that both the placenta and amniotic fluid contain multiple . . . cell types from the developing embryo, including fat, bone, and muscle,” says Anthony Atala, M.D., director of the Institute for Regenerative Medicine at Wake Forest University School of Medicine in Winston-Salem, N.C., who led the research team. “We asked, ‘Is there a possibility that within this cell population we can capture true stem cells?’ The answer is yes.”

Although only a few potential cells are present in amniotic fluid, they grow much more quickly than those collected from embryos—their number doubles every 36 hours. They also do not cause tumors like other stem cells can, another important difference, he says.

Dr. Atala notes that if collected from amniotic fluid, frozen and preserved, cells from some 4 million children born in the U.S. each year could potentially provide genetically matched cells for treating any neurological disease or neuromuscular disorder—a lifetime of “replacement” cells that would be recognized as their own.

The team has already “grown” brain cells using cells from amniotic fluid. Injected into mice with a rapidly progressing degenerative brain disease, the cells repopulated the damaged areas and formed connections with healthy neurons nearby.

The cells also secrete glutamate, a crucial neurotransmitter in the brain and spinal cord. Glutamate plays an important role in memory and in the formation of dopamine, the lack of which causes motor symptoms in Parkinson’s patients. They are also studying the cells in mice with an animal version of Alzheimer’s disease, and are optimistic that the cells could also be used to re-grow nerves in patients with spinal injuries, says Dr. Atala.

“The full range of stem cells from amniotic fluid remains to be determined, but so far we’ve been successful with every cell type we’ve attempted to produce.”

Predicting any timeline for possible neurological treatments at this point is impossible, he says. “This is still the early research stage, but we’re cautiously optimistic. We know patients are waiting.” NN

Kurt Samson is a medical and business writer whose work has appeared in Entrepreneur and Opportunity magazines.



A Magazine Begets a Mission

The Push for Excellence in Care for Traumatic Brain Injury

BY TOM VALEO

Tom Lupfer could have read the magazine, and just filed it away with all the others he had scanned over the years about traumatic brain injury.

But a light bulb went off in his head when he read the Special Report on brain injury in *Neurology Now* [September/October]. The article about a veteran recovering from his wounds predicted that traumatic brain injury might become the “signature wound” of the Iraq war. And Editor-in-Chief Robin L. Brey, M.D., quoted a researcher who said, “There are a lot of walking wounded who may look fine on the outside, but on the inside, they’re not the same person they were prior to the injury.”

“When I read that I thought, that’s our son Doug,” says Lupfer. “We experienced all those issues with his traumatic brain injury.”

Doug was not a vet. But Lupfer was so moved by the Special Report that he sent a copy to Texas Congressman Chet Edwards, who had fought to keep the Waco Veterans Affairs (VA) Medical Center in Texas from closing due to budget cuts.

Lupfer thought: The hospital already is a Center for Excellence for treating post-traumatic stress disorder. Why not make the hospital into a Center for Excellence for traumatic brain injury too?

He recalled the long journey his son had made. Early one morning in the summer of 1995, shortly after he started working at his father’s construction company, Doug was installing the roof on a metal warehouse in Waco, Texas. Dew had formed overnight, and as he walked across a metal panel Doug’s feet slipped out from under him and he fell

16 feet to the concrete floor below.

The fall, the swelling, and an operation to reduce the pressure on his brain by removing a 4-inch piece of his left frontal lobe left him mute and semi-conscious. Only through a year of therapy was he able to learn all over again how to talk, walk, tie his shoes, drive a car, and perform other mundane tasks. Despite the improvement, Doug would be changed forever.

“My memory’s not what it used to be,” says Doug. “I don’t see anything

In his letter to Rep. Edwards, Lupfer asked: “With an estimated 80,000 people per year sustaining long-term disabilities from traumatic brain injury and many more young military personnel being affected by this injury in the Iraq war, couldn’t we dedicate some of our efforts and resources to improving the treatment and assistance to those who need care and support?”

That effort may well have paid off. Rep. Edwards, while recovering from throat surgery in January, e-mailed that he remembered Lupfer’s letter. “Research on traumatic brain injury should be a high priority for both Veterans Administration and Department of Defense medical research programs, since the incidence of traumatic brain injury is so high in Iraq and Afghanistan,” Rep. Edwards wrote. “I don’t have enough facts to know whether the Waco VA hospital would be a good option for a traumatic brain injury Center of Excellence, but I will ask VA medical officials about this option as we put together a plan for the future of the Waco VA.”

Tom Lupfer will continue gathering facts too, because he now knows that a letter and a stirring story can sometimes make a difference for others who, like his son, must struggle every day with traumatic brain injury.

“There’s a lot that can be done for them,” he says. “So I’m going to push harder now and see if we can’t move this forward.” NN

Tom Valeo is a science and medical writer whose articles have appeared in Scientific American and WebMD.

Doug Lupfer, 11 years after his brain injury, has his hands full caring for sons Glenn (right) and Adam.



A stirring story propels a father to push for improved services.

coming toward me from the left, which makes a huge difference in driving. I have to physically turn and look to the left because I don’t have any peripheral vision there.”

He also has some trouble “staying on task,” says the elder Lupfer. “If you say to him, ‘Doug, drive down to the store and get a quart of milk,’ he may not come back for an hour, even though the store is just 5 minutes away. He’ll leave and suddenly something else seems more important to him. He might go and visit someone. He just needs a little extra supervision.”