



Spinal cord injury research and a personal connection encourage giving

In New York City in September, Mark Noble, Ph.D., director of the University of Rochester Stem Cell and Regenerative Medicine Institute, gave a lecture on novel therapies for the injured central nervous system, research that has demonstrated significant potential for the treatment of spinal cord injuries.

A professor of genetics, neurology, neurobiology and anatomy at the Medical Center, Noble told the gathering about the central nervous system's nerve cells and axons, the myelin-making oligodendrocytes, the multi-functional astrocytes, progenitor cells, which he called the workhorses of tissue building and repair, and about new discoveries that hold great hope for therapeutic advances.

But, this was not a lecture in a medical center classroom or at a scientific conference. Noble discussed the research at a private club in Manhattan before about 130 people brought together by Nancy Lieberman, a member of the board of trustees of the University of Rochester.

It also was a lecture with a very personal connection. Lieberman,

a 1977 graduate of the University and now a partner in a New York City law firm, suffered a serious spinal cord injury in a skiing accident on Christmas Eve in 2007 that made her a quadriplegic.

A visit by Noble to her hospital bed about 10 weeks after the accident and his discussion of treatment possibilities, Lieberman said, gave her hope when her own doctors had given her little.

"His visit and what he later told me about his research really kept me going," she said.

Still paralyzed from the midsection down, Lieberman can move her arms and has limited movement of her fingers. Though in a wheelchair, the partner at Skadden, Arps, Slate, Meagher & Flom LLP has returned "full blast" to her profession and to her successes as a lawyer. The September gathering of her friends was, in a sense, Lieberman thanking Noble and helping the research to move ahead more quickly.

"I felt it was inappropriate to ask my friends to make a contribution in advance in order to have dinner in my home. I thought my friends should meet Dr. Noble and his colleagues, Dr. Margot Mayer-Proschel and Dr. Christoph Proschel, and then decide what contribution, if any, they wanted to make to further the team's research," Lieberman said.

"I invited people who knew this was a cause near and dear to me,"

Above: University trustee Nancy Lieberman, center, with friends Beth Ring, left, and Marcea Lloyd.



she added. "They understood we would ask for money, but I needed them to hear what Mark Noble and the Proschels had to say."

The group responded, giving even more generously than Lieberman expected. As of Jan. 15, \$526,537 has been contributed to the Friends of Nancy Lieberman Fund to support spinal cord injury research at the Medical Center.

"There are people at the Medical Center and the University who are doing extraordinary research on diseases and other problems that would resonate with others the way the research of Mark Noble and his colleagues resonated with my friends," Lieberman said. "I hope other friends of the University read about this, get in touch with the University to learn about research and get involved in a significant and meaningful way."

Finding a way to heal an injured spinal cord

Noble is part of a research team highly experienced in studying development and injury of the brain and spinal cord. He was part of the team that discovered the oligodendrocyte progenitor cell more than 30 years ago, launching the field of stem cell biology in the nervous system. In the early 1990s, his laboratory then discovered how to use the progenitor cells in transplantation to repair myelin breakdown in the damaged spinal cord.

The other key members of the Rochester research team are Margot Mayer-Proschel, Ph.D., associate professor, and Christoph Proschel, Ph.D., assistant professor, in the Department of Biomedical Genetics.

Mayer-Proschel led the second generation of progenitor cell discovery in the nervous system, and discovered the progenitor cells now used by the group to make astrocytes, the major cells in the nervous system dedicated to supporting nerve cells and other cells of the brain and spinal cord. Chris Proschel is leading the team's studies on the specialized human astrocytes that are critical for clinical use and is developing new astrocyte transplantation therapies for the brain and spinal cord.

The Rochester team is partnered with two experts in spinal cord injury, Stephen Davies, Ph.D., associate professor of neurosurgery, and Jeannette Davies, Ph.D., assistant professor of neurosurgery, at the University of Colorado at Denver School of Medicine.

In a 2011 article in the scientific journal *PLoS One*, with Christoph Proschel and Jeannette Davies as the lead authors, the researchers demonstrated that using a specific human astrocyte sub-type is essential for healing the injured spinal cord.

In this work, the research team isolated human glial precursor cells, those first identified by Mayer-Proschel, and exposed them to different signaling molecules to turn them into two very different kinds of astrocytes. Those exposed to bone morphogenetic protein, or BMP, provided significant benefit when transplanted in rats with transected spinal cords, including up to a 70 percent increase in protection of injured spinal cord neurons, support for nerve fiber growth and marked recovery of motor function.

"We achieved levels of spinal cord injury repair that are far better than are seen with any other repair strategy," Noble said.

Remarkably, in work recently presented by the Rochester and Denver teams at the Society for Neuroscience meeting in November 2011, astrocyte transplants were able to promote repair in long-term, chronically injured animals. When injured animals received astrocyte transplants four

Top: Mark Noble explains the progress of his research.

Center: Margot Mayer-Proschel with guests Connie Steensma and Richard Prins.

Bottom: Christoph Proschel with guest Martin Berman



Mark Noble talks with Silda Wall Spitzer, her husband Eliot Spitzer and Judith S. Kaye, former Chief Judge of the State of New York.



Nancy Lieberman, with friend Jason Flom, ask the group to think “big and large.”

“There are people at the Medical Center and the University who are doing extraordinary research on diseases and other problems that would resonate with others the way the research of Mark Noble and his colleagues resonated with my friends,” — Nancy Lieberman

weeks or even eight months (or nearly half the life span of a typical rat) after being injured, the animals still recovered. This is significant because most people with spinal cord injuries have chronic injuries.

The research team now wants to move ahead to human clinical trials, using cells that will be generated in a specialized University of Rochester facility currently being built that is dedicated to growing cells for clinical use. But, the cost of such work is high, perhaps as much as \$7 million to \$10 million to reach and complete the first stage of clinical trials, Noble told the gathering.

Exceeding expectations

After Lieberman was injured in 2007, University President Joel Seligman asked Noble if he would visit her, even though the two of them had never met. Noble arrived at a Manhattan hospital on what Lieberman recalls as a rainy, raw and dreary Saturday afternoon in March 2008.

At this time, her arms were contracted close to her upper body, with almost no ability to move them. Worse, she had been told it was unlikely that she would get better.

“Mark told me not to listen to the Dr. No’s,” Lieberman said. “He said: ‘I am here to tell you there is hope.’ ”

Noble recommended a drug that enables axons that have lost their insulating myelin sheaths to conduct impulses. Approved by the FDA for treating people with multiple sclerosis, it also has benefited some people with spinal cord injuries. He also introduced Lieberman to Rajiv J. Ratan, M.D., Ph.D., executive director of the Burke Medical Research Institute, and his colleagues who are developing novel robotics-based approaches to physical therapy that show promise for promoting recovery in chronic spinal cord injury.

Lieberman started the drug therapy and entered the robotics program. Within a year, she had regained sufficient arm movement to return to work. During that time, she met others with a similar injury, including

a young girl whose spinal cord had been severed by a stray bullet.

After the publication of the *PLoS One* article, Lieberman, bolstered by the research team’s success and resolved to give others hope, began to plan for a fundraising event. “I am in a position to advocate for others who do not have the wherewithal that I have or who can’t reach people for whom this would resonate,” Lieberman said. “This research can help others. It is not just about law firm partners who hit a tree while skiing. This is really for many others, including girls in areas where gunshots go astray and for boys who jump in unexpectedly shallow pools of water. Very few kids will make it back as far as I have as they don’t have established careers like me. None of us would like to live like this and I wanted to do something about it.”

Lieberman originally planned to hold the gathering in her Manhattan apartment, but as the acceptances mounted, she moved the dinner party to a private club. She thought 70 would attend, but 128 came.

When the research presentation was completed, her friend, Jason Flom, rose, pledged \$25,000 and told the group to think “big and large.”

Lieberman thought the event could bring in perhaps \$200,000.

“We vastly exceeded my personal goal. It is pretty awesome,” she said.

An important aspect of the event is that the money raised provides unrestricted funding for the team’s work on spinal cord injury, Lieberman said, that will enable them to recruit additional graduate students and fellows. The money also can influence foundations to support the research because it shows strong support in the community.

“When an event is very personal to you, your friends will show up and write checks that you can’t imagine,” Lieberman said. “If Nancy Lieberman can do this from a wheelchair, others can too. I urge other members of the Rochester community to learn about the world class research being conducted at the Medical Center by contacting Frank Interlichia, senior associate vice president for Medical Center Advancement at 585-275-5880.”