High-powered imaging techniques

Dr. Daniel Reich is uncovering new characteristics of MS and charting a path for improved treatments.

by Susan Worley

Dr. Daniel S. Reich. Photo courtesy of Dr. Reich

Dr. Daniel S. Reich, the recipient of the fourth annual National MS Society's Barancik Prize for Innovation in Multiple Sclerosis Research, has devoted his career to developing and employing advanced imaging techniques for examining MS lesions, also known as plaques, which are areas of damage in the brain or spinal cord. One of the foremost imaging experts in the field of MS research, Dr. Reich is chief of the Translational Neuroradiology Section at the National Institute of Neurological Disorders and Stroke (NINDS), part of the National Institutes of Health (NIH).

His work is enabling the discovery of meaningful new characteristics of lesions and patterns of MS lesion development in the brain and spinal cord and, in turn, helping to lay the groundwork for the development of treatments to prevent or end the disease altogether.

"We're thrilled to present the 2016 Barancik Prize to Dr. Reich, who is pioneering novel approaches to imaging disease activity in people with MS and creating new pathways to better treatments," says Dr. Timothy Coetzee, chief advocacy, services, and research officer at the Society. "Dr. Reich is a brilliant scientist and a caring physician, and he serves as an inspiration to future generations of physicians and scientists dedicated to solving MS."

The Barancik Prize, funded by the Charles and Margery Barancik Foundation, is the world's largest award created exclusively for the recognition of MS research. Passionate supporters of MS research for more than 20 years, the Baranciks established the $100,000 international prize to reward exceptionally innovative scientific research geared toward treating or curing MS.

Career path

While he was still in his teens, Dr. Reich knew he wanted to study the brain.

"Before I started college, I remember really wanting to understand how nerve cells in the brain talked to one another. I knew that I wanted to pursue lab opportunities that would allow me to work on that question, first in a computational way, and eventually in an experimental way," he says.

Inspired in part by his father, a psychiatrist who also once worked for the NIH, Dr. Reich pursued an academically rigorous path, earning a degree in math and physics from Yale, and his MD and PhD from Cornell and Rockefeller universities, respectively. During medical school, Dr. Reich began to explore the world of magnetic resonance imaging (MRI).

"I was hooked immediately," he says, "because here was a way of seeing in exquisite detail what the brain looked like, while also being able to assess the brain in a quantitative way."

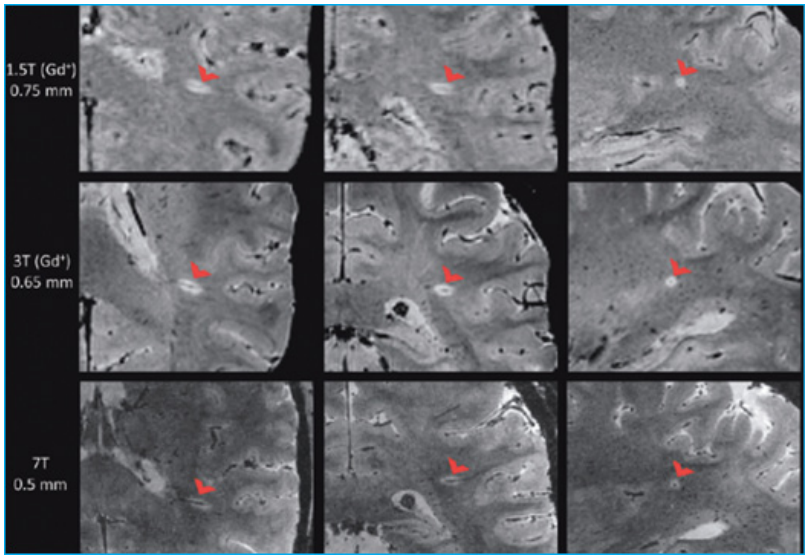
Dr. Reich completed a dual residency in radiology and neurology at Johns Hopkins, where he worked with his first mentor in the MS field, Dr. Peter Calabresi, a previous Barancik Prize winner. There he learned how complex neuroimaging could help link structural changes caused by MS in the brain and spinal cord with functional impairments caused by the disease.

Subsequently, under the guidance of his second MS mentor, Dr. Henry McFarland—then NIH chief of neuroimmunology and a 1998 winner of the National MS Society's John Dystel Prize for MS research—Dr. Reich continued to develop new MS imaging techniques, with access to exceptionally high-powered imaging equipment.

A powerful tool

Most of the projects conducted by Dr. Reich's lab at NIH involve the use of a 7-tesla MRI scanner, a device that is two to four times more powerful than standard clinical MRI scanners and can be used to capture images of complex biological processes that play a role in MS. (See images on p. 36.)

"You can see, for example, a characteristic feature of an MS plaque: a vein at the center of a lesion or plaque, where inflammation was initially caused by an opening in the blood-brain barrier," he says.



These images show the central vein inside an MS plaque as seen on the research 7-tesla scanner (bottom row), on a state-of-the-art clinical scanner (middle row) and on a typical scanner used in everyday clinical practice (top row). The vein is seen as a dot or line in the center of the bright lesion. The columns show different views—on the right from the side, in the middle from the front, and on the left top to bottom. The red arrows point to the lesion. Photo courtesy of Pascal Sati, PhD (NINDS)

Improved imaging of such features—as well as the use of techniques pioneered in Dr. Reich's lab—should help improve the ability to diagnose MS, in part by enabling experts to better

distinguish between MS lesions and lesions unrelated to the disease. Such imaging also is deepening our understanding of the biological underpinnings and stages of the disease, which should lead to the development of more effective treatments for MS.

Dr. Reich is also using the 7-tesla scanner in a large clinical study of people with MS who have volunteered to donate their brains after death. Under Dr. Reich's direction, scientists at NIH are carefully working with each individual and meticulously documenting changes in their MS over time. Dr. Reich and his colleagues hope that this study will ultimately yield insights into the disease and, perhaps, contribute to prevention of the disease. (To learn more about this or other MS studies at NIH, and to find out how to participate, call the NIH Neuroimmunology Clinic at 301-496-3825.)

A personal note

"Dr. Reich is truly a scholar and a gentleman," says Dr. Calabresi, now a professor of neurology and director of the Johns Hopkins Multiple Sclerosis Center, who nominated Dr. Reich for the prize. "His career record as a physician and scientist has been characterized by the highest core values and ethical principles that I have seen during my career."

Indeed, in his work with patients and colleagues, Dr. Reich is noted for exhibiting exceptional sensitivity. Just a few years ago, for example, he opened a slide presentation to colleagues with an audio clip of a concerto played by English cellist Jacqueline du Pré. The musical clip held several layers of meaning for Dr. Reich, a devoted amateur violin and viola player who was inspired by du Pré's music when he was just a child. In fact, du Pré—who was diagnosed with MS in her mid-20s and eventually stopped playing cello due to her symptoms—was Dr. Reich's introduction to the disease.

"Her story illustrates for me how MS can stop even the most gifted and most powerful people in their tracks," says Dr. Reich.

Initially inspired by her music, Dr. Reich is now devoted to finding solutions for everyone living with MS.

Susan Worley is a freelance medical writer who lives in Bryn Mawr, Pennsylvania.

Learn more about the Barancik Prize.